

**IN THE UNITED STATES DISTRICT COURT  
FOR THE WESTERN DISTRICT OF TEXAS  
WACO DIVISION**

PACT XPP SCHWEIZ AG

Plaintiff,

v.

INTEL CORPORATION

Defendant.

Case No. 6:19-cv-00273

**JURY TRIAL DEMANDED**

**COMPLAINT**

Plaintiff PACT XPP Schweiz AG, for its Complaint against Intel Corporation (“Intel” or “Defendant”), hereby alleges as follows:

**PARTIES**

1. Plaintiff PACT XPP Schweiz AG is a Swiss corporation, with its principal place of business in Switzerland. PACT XPP Schweiz AG is the assignee of all patents identified in this Complaint including all rights to sue for past and future damages for infringement of said patents.

2. On information and belief, Defendant Intel is a corporation duly organized and existing under the laws of the State of Delaware, having a regular and established place of business in the Western District of Texas, including at 1300 S. Mopac Expressway, Austin, Texas 78746.<sup>1</sup>

3. Intel, founded in 1968, has over an 80% market share in computer processor technology, and over \$70 Billion in revenues producing \$29.4 Billion of cash from operations and returned nearly \$16.3 Billion to shareholders in 2018 based on a gross profit margin of 61.7% of

---

<sup>1</sup> <https://www.intel.com/content/www/us/en/location/usa.html>;  
<https://www.intel.com/content/www/us/en/corporate-responsibility/intel-in-texas.html>.

revenues. Intel's two major operating segments are the PC Client Group, which produced over \$37 Billion in revenue for 2018 and focuses on the processors found in consumer-grade netbooks and desktops, and the Data Center Group, which produced over \$32 Billion in revenue and focuses on processors found in enterprise-level servers.

**NATURE OF THE ACTION**

4. This is a civil action for patent infringement of the following patents by Defendant Intel: U.S. Patent Nos. 7,928,763 ("the '763 Patent"), 8,301,872 ("the '872 Patent"), 8,312,301 ("the '301 Patent"), 8,471,593 ("the '593 Patent"), 8,686,549 ("the '549 Patent"), 8,819,505 ("the '505 Patent"), 9,037,807 ("the '807 Patent"), 9,075,605 ("the '605 Patent"), 9,170,812 ("the '812 Patent"), 9,250,908 ("the '908 Patent"), 9,436,631 ("the '631 Patent"), and 9,552,047 ("the '047 Patent") (collectively, the "Asserted Patents"). This action is based upon the Patent Laws of the United States, 35 U.S.C. § 1 *et seq.*

**JURISDICTION AND VENUE**

5. This Court has jurisdiction over the subject matter of this action pursuant to 28 U.S.C. §§ 1331 and 1338(a).

6. This Court has personal jurisdiction over Intel because Intel manufactures products that are and have been used, offered for sale, sold, and purchased in the Western District of Texas, and Intel has committed, and continues to commit, acts of infringement in the Western District of Texas, has conducted business in the Western District of Texas, and/or has engaged in continuous and systematic activities in the Western District of Texas.

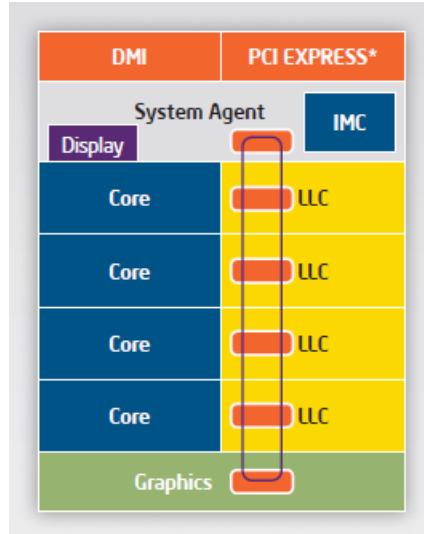
7. Under 28 U.S.C. §§ 1391(b)-(d) and 1400(b), venue is proper in this judicial district because Intel maintains a regular and established place of business in this district and has committed acts of infringement within this judicial district giving rise to this action.

## **FACTUAL BACKGROUND**

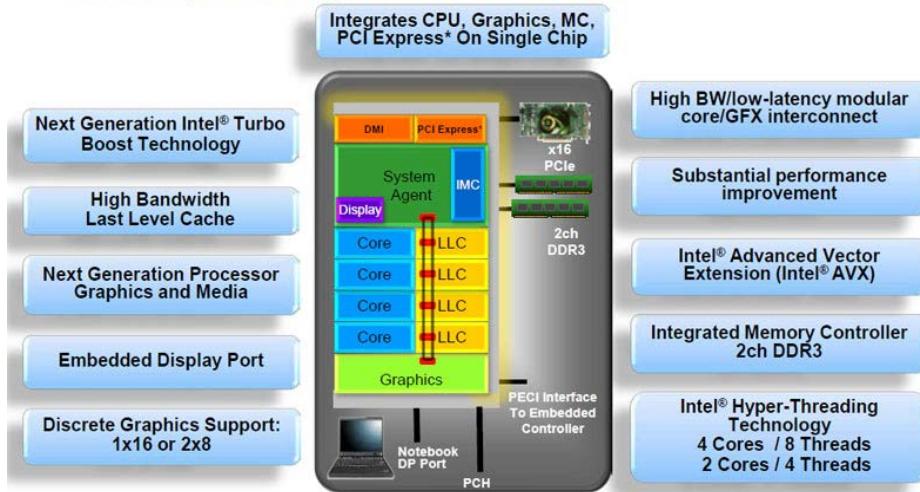
8. PACT XPP Schweiz's predecessor and assignor PACT XPP TECHNOLOGIES AG (Lichtenstein) (hereinafter collectively referred to as "PACT") was founded in 1996 in Germany by Martin Vorbach. Mr. Vorbach (the lead inventor on all of PACT's patents) has been experimenting with parallel computing since the mid-1980s. Mr. Vorbach embarked on the design of a completely different type of a multi-core computer architecture—that was the forerunner of Intel's multi-core processors. Mr. Vorbach focused his designs on multi-core processing systems including how to handle more complex algorithms with large amounts of data involving multiple processors on a single chip. Because of this, he encountered unique challenges that the general CPU market would not face for years to come and was granted over 70 U.S. patents. On information and belief, Intel's multi-core processors at issue were not released until 2011, years after the priority dates of the Asserted Patents.

9. For example, one challenge Mr. Vorbach had to solve was how to move and access data in a multi-core system from one core to the next for large pipelined operations. This led to his development of bus architectures for multicore processors with multiple paths, including those using ring bus systems, for both configuring cores and accessing data in the cores and in local memory including the patents identified herein.

10. It was not until 2011 that Intel released its "Sandy Bridge" chip architecture accused of infringement in this Complaint. Sandy Bridge included a ring-based interconnect for communication between multiple processor cores, processor graphics and cache system. The ring bus architecture takes up less space on the die while also scaling well for larger core counts—in contrast to Intel's earlier dual core designs. Intel coupled this with a last level cache (LLC) that could be alternately shared among the cores. In 2017, Intel introduced a mesh bus architecture, which is a modified version of the ring bus that also implements Mr. Vorbach's invention.



## Sandy Bridge: Overview



11. This architecture has been incorporated into most of Intel's Core Series processor family—the i3, i5, i7, and i9 processors—found in computers and on information and belief other processors manufactured and sold by Intel. Starting with the second generation (code-named Sandy Bridge, released 2011), these processors have contained a variant of the above-described ring bus (or equivalents) and LLC feature set including the Sandy Bridge, Ivy Bridge, Haswell, Broadwell, Skylake, Kaby Lake, Coffee Lake architectures and, on information and belief, other processors including ring bus architecture (or equivalents). According to Intel's most recent

reported financial results for 2018,<sup>2</sup> its revenue was over \$32 Billion for its Data Center Group and \$37.0 Billion for its PC center group.

12. Another contribution Mr. Vorbach made to the multi-core system is to change the clock frequencies of part of the multi-core system in a particular way to take advantage of the processing power of certain cores and in the meantime achieve power efficiency. This invention was adopted by Intel in its Turbo Boost technology many years later. For example, Turbo Boost 2.0 was introduced in 2011 with the Sandy Bridge microarchitecture, and Turbo Boost Max 3.0 was introduced in 2016 with the Broadwell microarchitecture. On information and belief, Turbo-Boost-enabled processors have been manufactured since 2008.

13. Another contribution Mr. Vorbach made to the multi-core system is a stacking technique, according to which the multi-core processors and the bus system are stacked on a plurality of dies in an efficient way. Intel just adopted this stacking technique in recent announcements.

14. In December 2018, Intel hosted an Architecture Day conference in California for analysts and media that allowed Intel's top executives, architects and fellows to reveal their next-generation technologies to a captive audience. During the conference, Intel announced that it had created a new 3D packaging technology, called "Foveros." Foveros is expected to extend die stacking beyond passive interposers and stacked memory to high-performance logic, such as CPU. In January 2019, during the CES conference, Intel made further announcement of a new product, Lakefield, that implements the Foveros technology. The Foveros technology, however, takes

---

<sup>2</sup> <https://www.intc.com/investor-relations/investor-education-and-news/investor-news/press-release-details/2019/Intel-Reports-Fourth-Quarter-2018-Financial-Results/default.aspx>

advantage of PACT's invention disclosed in U.S. Patent No. 8,686,549, which, on information and belief, Intel has been aware of since 2015.

15. PACT does not make or sell products in the United States that implement the asserted patents, and to PACT's knowledge no PACT licensed products made or sold in the United States implement the asserted patents.

#### **INTEL HAS TOUTED THE BENEFITS OF THE INFRINGING TECHNOLOGY**

16. Intel itself has touted the improvements realized by the incorporation of the accused technologies.

17. In Intel's technical materials, it marketed the ring bus and L3 cache architecture by pointing to their specific advantages, such as robustness, scalability, and modularity:

**Coherency and Ordering**

- ▶ Ring does not maintain transaction ordering
  - ▶ Transactions flow in parallel and out-of-order
- ▶ Ordering requirement maintained by agents sending the requests
  - ▶ IA Core, Processor Graphics, System Agent
- ▶ Cache Coherency protocol is based on QPI
  - ▶ MESI based Source Snooping

**Robustness – Distributed coherency & ordering  
Scalability – Bandwidth, Latency & Performance  
Modularity – to number of Cores**



18. Regarding Turbo Boost, Intel states on its official website that "Intel® Turbo Boost Technology 2.0 accelerates processor and graphics performance for peak loads, automatically allowing processor cores to run faster than the rated operating frequency if they're operating below

power, current, and temperature specification limits.”<sup>3</sup> “Turbo Boost Max Technology 3.0 . . . enhances it with a massive frequency boost on your fastest cores for more flexibility to get the best from your processor.”<sup>4</sup> “As the name implies, processors with this feature will enable extra performance when you need it most. . . . With this exciting new technology, end users can game faster, be more productive, and do more, because it’s Intel.”<sup>5</sup>

19. Intel also touted the Foveros technology on its official website: “Foveros paves the way for devices and systems combining high-performance, high-density and low-power silicon process technologies. Foveros is expected to extend die stacking beyond traditional passive interposers and stacked memory to high-performance logic, such as CPU, graphics and AI processors for the first time. The technology provides tremendous flexibility as designers seek to ‘mix and match’ technology IP blocks with various memory and I/O elements in new device form factors. It will allow products to be broken up into smaller ‘chiplets,’ where I/O, SRAM and power delivery circuits can be fabricated in a base die and high-performance logic chiplets are stacked on top. . . . Foveros is the next leap forward following Intel’s breakthrough Embedded Multi-die Interconnect Bridge (EMIB) 2D packaging technology, introduced in 2018.”<sup>6</sup>

#### **THE ASSERTED PATENTS**

20. On April 19, 2011, the U.S. Patent and Trademark Office duly and legally issued the ’763 Patent, titled “Multi-Core Processing System.” The ’763 Patent names Martin Vorbach as the sole inventor. The ’763 Patent has been in full force and effect since its issuance. PACT

---

<sup>3</sup> <https://www.intel.com/content/www/us/en/architecture-and-technology/turbo-boost/turbo-boost-technology.html>

<sup>4</sup> <https://www.intel.com/content/www/us/en/architecture-and-technology/turbo-boost/turbo-boost-max-technology.html>

<sup>5</sup> <https://www.intel.com/content/www/us/en/architecture-and-technology/turbo-boost/turbo-boost-max-technology.html>

<sup>6</sup> <https://newsroom.intel.com/articles/new-intel-architectures-technologies-target-expanded-market-opportunities/#gs.uIfUyfYJ>

owns by assignment the entire right, title, and interest in and to the '763 Patent, including the right to seek damages for past, current, and future infringement thereof. PACT is the sole owner of the '763 Patent. A copy of the '763 Patent is attached hereto as Exhibit A.

21. On October 30, 2012, the U.S. Patent and Trademark Office duly and legally issued the '872 Patent, titled "Pipeline Configuration Protocol and Configuration Unit Communication." The '872 Patent names Martin Vorbach, Volker Baumgarte, Gerd Ehlers, Frank May, and Armin Nuckel as co-inventors. The '872 Patent has been in full force and effect since its issuance. PACT owns by assignment the entire right, title, and interest in and to the '872 Patent, including the right to seek damages for past, current, and future infringement thereof. PACT is the sole owner of the '872 Patent. A copy of the '872 Patent is attached hereto as Exhibit B.

22. On November 13, 2012, the U.S. Patent and Trademark Office duly and legally issued the '301 Patent, titled "Methods and Devices for Treating and Processing Data." The '301 Patent names Martin Vorbach and Volker Baumgarte as co-inventors. The '301 Patent has been in full force and effect since its issuance. PACT owns by assignment the entire right, title, and interest in and to the '301 Patent, including the right to seek damages for past, current, and future infringement thereof. PACT is the sole owner of the '301 Patent. A copy of the '301 Patent is attached hereto as Exhibit C.

23. On June 25, 2013, the U.S. Patent and Trademark Office duly and legally issued the '593 Patent, titled "Logic Cell Array and Bus System." The '593 Patent names Martin Vorbach, Frank May, Dirk Reichardt, Frank Lier, Gerd Ehlers, Armin Nuckel, Volker Baumgarte, Prashant Rao, and Jens Oertel as co-inventors. The '593 Patent has been in full force and effect since its issuance. PACT owns by assignment the entire right, title, and interest in and to the '593 Patent,

including the right to seek damages for past, current, and future infringement thereof. PACT is the sole owner of the '593 Patent. A copy of the '593 Patent is attached hereto as Exhibit D.

24. On April 1, 2014, the U.S. Patent and Trademark Office duly and legally issued the '549 Patent, titled "Reconfigurable Elements." The '549 Patent names Martin Vorbach as the sole inventor. The '549 Patent has been in full force and effect since its issuance. PACT owns by assignment the entire right, title, and interest in and to the '549 Patent, including the right to seek damages for past, current, and future infringement thereof. PACT is the sole owner of the '549 Patent. A copy of the '549 Patent is attached hereto as Exhibit E.

25. On August 26, 2014, the U.S. Patent and Trademark Office duly and legally issued the '505 Patent, titled "Data Processor Having Disabled Cores." The '505 Patent names Martin Vorbach and Robert Munch as co-inventors. The '505 Patent has been in full force and effect since its issuance. PACT owns by assignment the entire right, title, and interest in and to the '505 Patent, including the right to seek damages for past, current, and future infringement thereof. PACT is the sole owner of the '505 Patent. A copy of the '505 Patent is attached hereto as Exhibit F.

26. On May 19, 2015, the U.S. Patent and Trademark Office duly and legally issued the '807 Patent, titled "Processor Arrangement on a Chip Including Data Processing, Memory, and Interface Elements." The '807 Patent names Martin Vorbach as the sole inventor. The '807 Patent has been in full force and effect since its issuance. PACT owns by assignment the entire right, title, and interest in and to the '807 Patent, including the right to seek damages for past, current, and future infringement thereof. PACT is the sole owner of the '807 Patent. A copy of the '807 Patent is attached hereto as Exhibit G.

27. On July 7, 2015, the U.S. Patent and Trademark Office duly and legally issued the '605 Patent, titled "Methods and Devices for Treating and Processing Data." The '605 Patent names Martin Vorbach and Volker Baumgarte as co-inventors. The '605 Patent has been in full force and effect since its issuance. PACT owns by assignment the entire right, title, and interest in and to the '605 Patent, including the right to seek damages for past, current, and future infringement thereof. PACT is the sole owner of the '605 Patent. A copy of the '605 Patent is attached hereto as Exhibit H.

28. On October 27, 2015, the U.S. Patent and Trademark Office duly and legally issued the '812 Patent, titled "Data Processing System Having Integrated Pipelined Array Data Processor." The '812 Patent names Martin Vorbach, Jurgen Becker, Markus Weinhardt, Volker Baumgarte, and Frank May as co-inventors. The '812 Patent has been in full force and effect since its issuance. PACT owns by assignment the entire right, title, and interest in and to the '812 Patent, including the right to seek damages for past, current, and future infringement thereof. PACT is the sole owner of the '812 Patent. A copy of the '812 Patent is attached hereto as Exhibit I.

29. On February 2, 2016, the U.S. Patent and Trademark Office duly and legally issued the '908 Patent, titled "Multi-Processor Bus and Cache Interconnection System." The '908 Patent names Martin Vorbach, Volker Baumgarte, Frank May, and Armin Nuckel as co-inventors. The '908 Patent has been in full force and effect since its issuance. PACT owns by assignment the entire right, title, and interest in and to the '908 Patent, including the right to seek damages for past, current, and future infringement thereof. PACT is the sole owner of the '908 Patent. A copy of the '908 Patent is attached hereto as Exhibit J.

30. On September 6, 2016, the U.S. Patent and Trademark Office duly and legally issued the '631 Patent, titled "Chip Including Memory Element Storing Higher Level Memory

Data on a Page by Page Basis.” The ’631 Patent names Martin Vorbach as the sole inventor. The ’631 Patent has been in full force and effect since its issuance. PACT owns by assignment the entire right, title, and interest in and to the ’631 Patent, including the right to seek damages for past, current, and future infringement thereof. PACT is the sole owner of the ’631 Patent. A copy of the ’631 Patent is attached hereto as Exhibit K.

31. On January 24, 2017, the U.S. Patent and Trademark Office duly and legally issued the ’047 Patent, titled “Multiprocessor Having Runtime Adjustable Clock and Clock Dependent Power Supply.” The ’047 Patent names Martin Vorbach and Volker Baumgarte as co-inventors. The ’047 Patent has been in full force and effect since its issuance. PACT owns by assignment the entire right, title, and interest in and to the ’047 Patent, including the right to seek damages for past, current, and future infringement thereof. PACT is the sole owner of the ’047 Patent. A copy of the ’047 Patent is attached hereto as Exhibit L.

#### **THE ACCUSED INTEL INSTRUMENTALITIES**

32. Intel has infringed the Asserted Patents through the manufacture, use (including testing), sale, offer for sale, advertisement, importation, shipment and distribution, service, installation, and/or maintenance of Intel Core processors with Sandy Bridge and above microarchitectures (the “Accused Core Instrumentalities”), Intel Xeon processors with Sandy Bridge and above microarchitectures (the “Accused Xeon Instrumentalities”), and Intel Celeron Processors with Sandy Bridge and above microarchitectures (the “Accused Celeron Instrumentalities”) and on information and belief other processors incorporating ring bus architecture or equivalents (such as mesh bus architecture).

33. The Accused Core Instrumentalities are Intel Core processors with Sandy Bridge and above microarchitectures, including, but not limited to, Core i3, Core i5, Core i7, Core i9, and

other core processors with the microarchitectures of Sandy Bridge, Ivy Bridge, Haswell, Broadwell, Skylake, Kaby Lake, Coffee Lake, Cannon Lake, Ice Lake, and above.

34. The Accused Xeon Instrumentalities are Intel Xeon processors with Sandy Bridge and above microarchitectures, including, but not limited to, E3, E5, E7, and other Xeon processors with the microarchitectures of Sandy Bridge, Ivy Bridge, Haswell, Broadwell, Skylake, Kaby Lake, and above.

35. Other accused instrumentalities include the Accused Turbo Boost Instrumentalities, the Accused Stacking Instrumentalities, and the Accused '505 Instrumentalities as defined and discussed in corresponding sections below.

**COUNT I – INFRINGEMENT OF U.S. PATENT NO. 7,928,763**

36. PACT incorporates each of the above paragraphs 1-35 as though fully set forth herein.

37. PACT is informed and believes, and thereon alleges, that Intel has infringed and unless enjoined will continue to infringe one or more claims of the '763 Patent, in violation of 35 U.S.C. § 271, by, among other things, making, using (including testing), offering to sell, and selling within the United States, supplying or causing to be supplied in or from the United States, and importing into the United States, without authority or license, Intel products with the infringing features, including the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities.

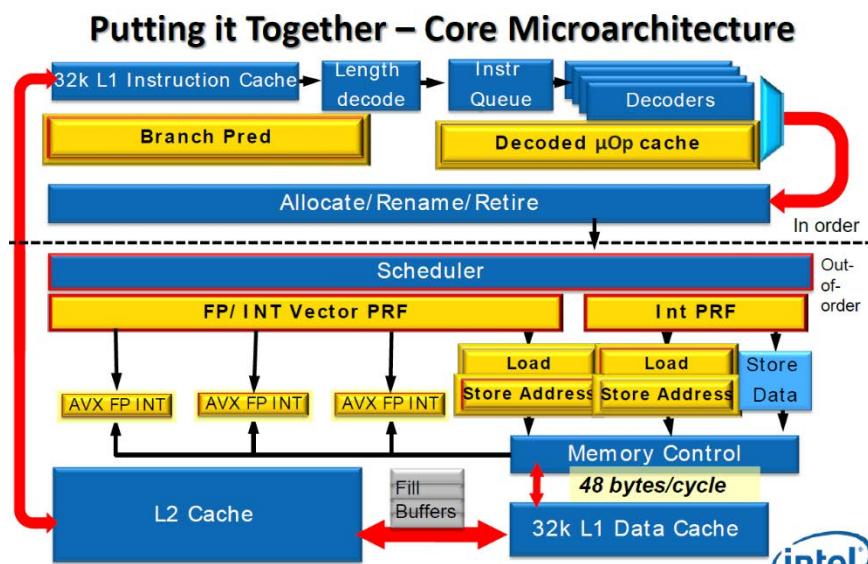
38. For example, the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities embody every limitation of at least claim 1 of the '763 Patent, literally or under the doctrine of equivalents, as set forth below. The further descriptions below, which are based on publicly available information, are preliminary examples and are non-limiting.

**“A multi-processor chip, comprising”**

39. The Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities are multi-core processors, and hence, a multi-processor chip.

**“a plurality of data processing cells, each adapted for sequentially executing at least one of algebraic and logic functions and having”**

40. The Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities include a plurality of cores, each of which is adapted for sequentially executing at least one of algebraic and logic functions as shown in the figure below:



**“at least one arithmetic logic unit; at least one data register file; a program pointer; and at least one instruction decoder”**

41. The Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities include multi-core processors further including multiple ALUs, general purpose registers, instruction pointer, and decoders, thus, including the recited arithmetic logic unit, at least one data register file, a program pointer, and at least one instruction decoder.

**“a plurality of memory cells”**

42. The Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities include Last Level Caches that constitute a plurality of memory cells.

***“at least one interface unit”***

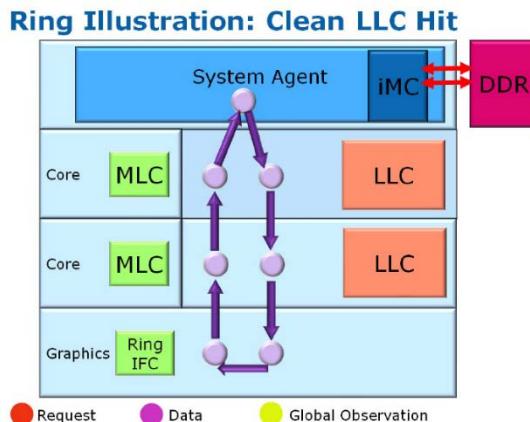
43. The Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities include a System Agent and/or components within or connected or attached to the System Agent and/or the Last Level Caches (such as cache box) that constitute at least one interface unit.

***“at least one Memory Management Unit (MMU); and”***

44. The Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities include memory management functionalities, and thus, at least one Memory Management Unit (MMU).

***“a bus system for interconnecting the plurality of data processing cells, the plurality of memory cells, and the at least one interface unit, wherein the bus system is adapted for programmably interconnecting at runtime at least one of data processing cells and memory cells with at least one of memory cells and one or more of the at least one interface unit.”***

45. The Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities include a ring bus system (or equivalents) programmably interconnecting at runtime the cores, the LLCs and/or the interface unit identified above as shown in the figure below:



46. In violation of 35 U.S.C. § 271, Intel has infringed and is currently infringing, directly and/or through intermediaries, the '763 Patent by making, using, selling, offering for sale, and/or importing into the United States, without authority, products that practice at least claim 1 of the '763 Patent. These products include the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities, and any other products that incorporate the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities. Intel has infringed and is currently infringing literally and/or under the doctrine of equivalents.

47. On information and belief, PACT asserts that Intel was aware of this patent before this lawsuit was filed, and at least as of the service of the Complaint in *PACT XPP Schweiz AG v. Intel Corporation*, 1-19-cv-00267 (DED), Intel had actual knowledge of its infringement of the '763 Patent.

48. PACT is informed and believes, and thereon alleges, that Intel, subsequent to the time it first learned of the '763 Patent and at least as of the time of service of the Complaint in *PACT XPP Schweiz AG v. Intel Corporation*, 1-19-cv-00267 (DED), specifically intended to induce patent infringement by third-party original equipment manufacturers (OEMs), customers, and users of the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the

Accused Celeron Instrumentalities and had knowledge that the inducing acts would cause infringement or is willfully blind to the possibility that their inducing acts would cause infringement. Intel has sold and continues to sell the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities to OEM products (*e.g.*, computers, servers, laptops, tablets, etc.), knowing that the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities will be included in the OEM products and sold to customers in the United States in violation of U.S. patent law, and/or to original design manufacturers (ODMs), knowing that the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities will ultimately be included in OEM products and sold to customers in the United States.

49. Indeed, Intel's "Intel Inside" campaign has informed customers through advertising and stickers on the OEM products themselves that the products contain the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities. Intel also knows that many such OEM products that contain the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities are made outside the United States and are imported into the United States in violation of U.S. patent law. Intel also knows that U.S. customers of the OEMs use the OEM products containing the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities in the United States in violation of U.S. patent law.

50. Intel also publicly provides documentation, including datasheets available through Intel's publicly accessible ARK service and software developer's manuals, instructing customers on uses of Intel's products that infringe the '763 Patent. *See, e.g.*, <http://ark.intel.com>. In addition, Intel specifically advertises and promotes the infringing use of Intel's products, including the ring

bus system and its equivalent. *See, e.g.*, <https://software.intel.com/en-us/articles/how-memory-is-accessed>.

51. On information and belief, Intel's customers directly infringe the '763 Patent by, for example, making, using, offering to sell, and selling within the United States, and importing into the United States, without authority or license, products containing the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities.

52. Intel contributes to the infringement of the '763 Patent in violation of 35 U.S.C. § 271(c). As stated above, on information and belief Intel was aware of the '763 Patent before this lawsuit was filed but Intel was aware of the '763 Patent at least as of the time of service of the Complaint in *PACT XPP Schweiz AG v. Intel Corporation*, 1-19-cv-00267 (DED). Intel thus offers to sell and sells within the United States the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities knowing that those products constitute a material part of the claimed invention because Intel incorporates the accused components (ring bus system, multi-cores, LLCs, etc.) into the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities.

53. Intel knows that the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities are especially made or especially adapted for use in infringing the '763 Patent because the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities all contain the infringing components (ring bus system, multi-cores, LLCs, etc.). Furthermore, because the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities contain the infringing components (ring bus system, multi-cores, LLCs, etc.), they are not a staple article or commodity of commerce suitable for substantial non-infringing use.

54. In addition, Intel offers to sell and sells the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities to Original Equipment Manufacturers (OEMs) and/or Original Design Manufacturers (ODMs) who then incorporate the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities into infringing products which are used, sold, offered for sale, and/or imported in the United States in an infringing manner. Accordingly, Intel is liable as a contributory infringer.

55. In the alternative, to the extent Intel does not meet all of the limitations of the '763 Patent by making the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities in the United States, Intel infringes under 35 U.S.C. § 271(f)(1) and (f)(2) by supplying from the United States a substantial portion of the components of the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities (for example, structures or components contained in semiconductor wafers or dies or the like), and actively induces the combination of components outside the United States in a manner that would infringe the '763 Patent (for example, by packaging or assembly, or by incorporation into computers, laptops, servers, tablets, or the like by ODMs or OEMs). Intel further supplies from the United States components which are especially made and especially adapted for use in practicing the '763 Patent, and not staple articles or a commodity of commerce suitable for substantial non-infringing use (for example, structures or components contained in semiconductor wafers or dies or the like). Intel knows the components are especially made and especially adapted to be combined outside of the United States in a manner that would infringe the '763 Patent (for example, by packaging or assembly, or by incorporation into desktop computers, laptops, servers, tablets, or the like by ODMs or OEMs). Based on these facts and the

facts set forth in the paragraphs above, Intel infringes the '763 Patent under 35 U.S.C. § 271(f)(1) and (f)(2).

56. As a result of Intel's infringement of the '763 Patent, PACT has been damaged. PACT is entitled to recover for damages sustained as a result of Intel's wrongful acts in an amount subject to proof at trial but no less than a reasonable royalty.

57. In addition, Intel's infringing acts and practices have caused and are causing immediate and irreparable harm to PACT.

58. PACT is informed and believes, and thereon alleges, that the infringement of the '763 Patent by Intel has been and continues to be willful. As noted above, at least as of the service of the Complaint in PACT XPP Schweiz AG v. Intel Corporation, 1-19-cv-00267 (DED), Intel has actual knowledge of its infringement of the '763 Patent. Intel has deliberately continued to infringe in a wanton, malicious, and egregious manner, with reckless disregard for PACT's patent rights. Thus, Intel's infringing actions have been and continue to be consciously wrongful, entitling PACT to increased damages under 35 U.S.C. § 284.

59. PACT is informed and believes, and thereon alleges, that this is an exceptional case, which warrants an award of attorney's fees to PACT pursuant to 35 U.S.C. § 285.

**COUNT II – INFRINGEMENT OF U.S. PATENT NO. 8,301,872**

60. PACT incorporates each of the above paragraphs 1-35 as though fully set forth herein.

61. PACT is informed and believes, and thereon alleges, that Intel has infringed and unless enjoined will continue to infringe one or more claims of the '872 Patent, in violation of 35 U.S.C. § 271, by, among other things, making, using (including testing), offering to sell, and selling within the United States, supplying or causing to be supplied in or from the United States, and importing into the United States, without authority or license, Intel products with the infringing

features, including the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities.

62. For example, the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities embody every limitation of at least claim 2 of the '872 Patent, literally or under the doctrine of equivalents, as set forth below. The further descriptions below, which are based on publicly available information, are preliminary examples and are non-limiting.

***"A microprocessor chip comprising: a plurality of processor cores"***

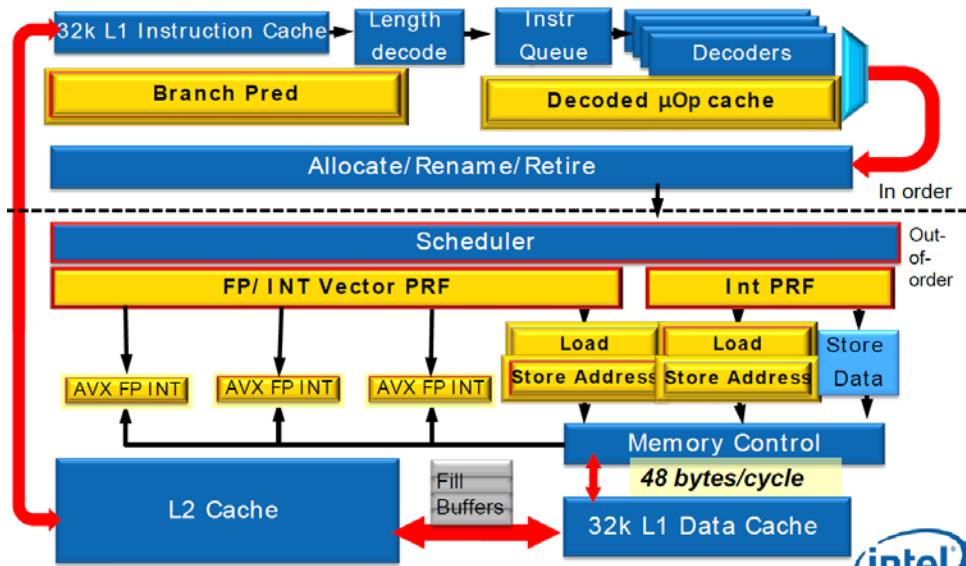
63. The Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities constitute a microprocessor chip comprising a plurality of processor cores, because they are multi-core processors.

***"a cache system including multiple levels, including at least (a) a first cache level that includes at least one cache and (b) at least one superior cache level including a plurality of same level cache nodes each including an internal cache memory; and"***

64. The Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities include a cache system including multiple levels, for example, L1 caches, L2 caches, and Last Level Caches (LLCs).

65. The above identified cache system includes a first cache level that includes at least one cache, shown in the exemplary figure below:

## Putting it Together – Core Microarchitecture



66. The above identified cache system also includes at least one superior cache level including a plurality of same level cache nodes each including an internal cache memory, for example, multiple Last Level Caches (LLCs). Each LLC includes its internal cache memory. ***“a bus system”***

67. The Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities include at least a ring bus system (or equivalents) which constitutes a bus system.

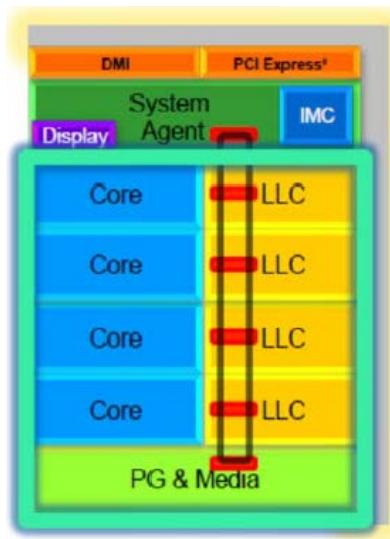
***“wherein: for each of at least one of the plurality of processor cores, a respective cache of the first cache level is assigned and dedicated to the respective processor core, to exclusion of the others of the plurality of processor cores”***

68. In the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities, each processor core includes at least one first cache level identified in the figure above operating only on such processor core it belongs to, but not other processor cores, and thus, the each processor core of the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities includes a respective

cache of the first cache level assigned and dedicated to the respective processor core, to exclusion of the others of the plurality of processor cores.

***“the bus system includes segments interconnecting, at least one of directly and indirectly, at least the plurality of same level cache nodes (i) to each other and (ii) to the plurality of processor cores”***

69. In the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities, the ring bus (or equivalents) includes segments interconnecting the LLCs and cores in the way shown in the figure below, therefore, interconnecting, at least one of directly and indirectly, at least the plurality of same level cache nodes (i) to each other and (ii) to the plurality of processor cores.



***“each of the plurality of same level cache nodes is communicatively connectable with each of the plurality of processor cores via the bus system for transferring data between the respective cache node and respective processor core”***

70. In the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities, each LLC is communicatively connectable with each core via the ring bus (or equivalents) for data transmission as shown in the figure above. Therefore,

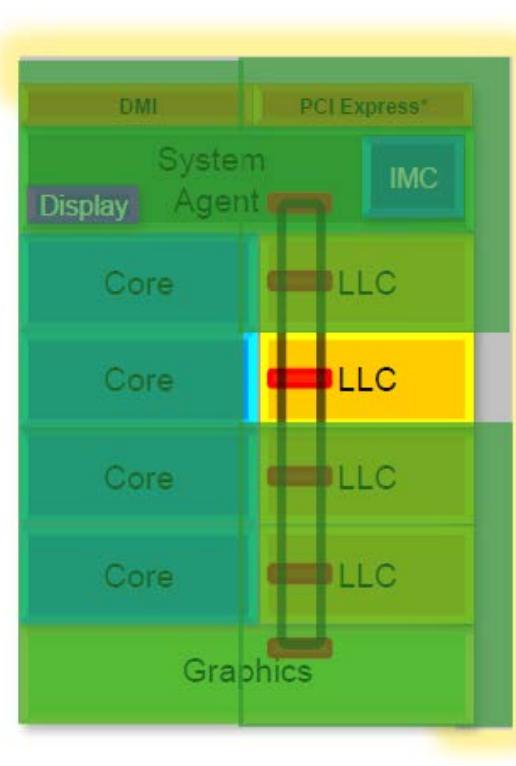
each of the plurality of same level cache nodes is communicatively connectable with each of the plurality of processor cores via the bus system for transferring data between the respective cache node and respective processor core.

***“a highest of the multiple levels is connected to a higher level memory”***

71. In the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities, the LLCs are further connected to other memories such as RAM and/or various types of DDRs and thus connected to a higher level memory.

***“each of the plurality of same level cache nodes is connected to at least two segments of the bus system and is capable of (i) relaying data from a first one of the segments to which it is connected to a second one of the segments to which it is connected and (ii) transmitting data between its internal cache memory and the segments to which it is connected.”***

72. In the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities, each of the LLC is connected to at least two segments of the ring bus (or equivalents) as shown in the figure below and is capable of relaying data from one segment to another segment and transmitting data between its internal cache and the two segments.



73. In violation of 35 U.S.C. § 271, Intel has infringed and is currently infringing, directly and/or through intermediaries, the '872 Patent by making, using, selling, offering for sale, and/or importing into the United States, without authority, products that practice at least claim 2 of the '872 Patent. These products include the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities, and any other products that incorporate the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities. Intel has infringed and is currently infringing literally and/or under the doctrine of equivalents.

74. On information and belief, PACT asserts that Intel was aware of this patent before this lawsuit was filed, and at least as of the service of the Complaint in PACT XPP Schweiz AG v. Intel Corporation, 1-19-cv-00267 (DED), Intel had actual knowledge of its infringement of the '872 Patent.

75. PACT is informed and believes, and thereon alleges, that Intel, subsequent to the time it first learned of the '872 Patent and at least as of the time of service of the Complaint in PACT XPP Schweiz AG v. Intel Corporation, 1-19-cv-00267 (DED), specifically intended to induce patent infringement by third-party original equipment manufacturers (OEMs), customers, and users of the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities and had knowledge that the inducing acts would cause infringement or is willfully blind to the possibility that their inducing acts would cause infringement. Intel has sold and continues to sell the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities to OEMs making OEM products (*e.g.*, computers, servers, laptops, tablets, etc.), knowing that the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities will be included in the OEM products and sold to customers in the United States in violation of U.S. patent law, and/or to original design manufacturers (ODMs), knowing that the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities will ultimately be included in OEM products and sold to customers in the United States.

76. Indeed, Intel's "Intel Inside" campaign has informed customers through advertising and stickers on the OEM products themselves that the products contain the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities. Intel also knows that many such OEM products that contain the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities are made outside the United States and are imported into the United States in violation of U.S. patent law. Intel also knows that U.S. customers of the OEMs use the OEM products containing the Accused Core

Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities in the United States in violation of U.S. patent law.

77. Intel also publicly provides documentation, including datasheets available through Intel's publicly accessible ARK service and software developer's manuals, instructing customers on uses of Intel's products that infringe the '872 Patent. *See, e.g.,* <http://ark.intel.com>. In addition, Intel specifically advertises and promotes the infringing use of Intel's products, including the ring bus system and its equivalent. *See, e.g.,* <https://software.intel.com/en-us/articles/how-memory-is-accessed>.

78. On information and belief, Intel's customers directly infringe the '872 Patent by, for example, making, using, offering to sell, and selling within the United States, and importing into the United States, without authority or license, products containing the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities.

79. Intel contributes to the infringement of the '872 Patent in violation of 35 U.S.C. § 271(c). As stated above, on information and belief Intel was aware of the '872 patent before this lawsuit was filed but Intel was aware of the '872 Patent at least as of the time of service of the Complaint in PACT XPP Schweiz AG v. Intel Corporation, 1-19-cv-00267 (DED). Intel thus offers to sell and sells within the United States the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities knowing that those products constitute a material part of the claimed invention because Intel incorporates the accused components (ring bus system, multi-cores, LLCs, etc.) into the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities.

80. Intel knows that the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities are especially made or especially

adapted for use in infringing the '872 Patent because the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities all contain the infringing components (ring bus system, multi-cores, LLCs, etc.). Furthermore, because the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities contain the infringing components (ring bus system, multi-cores, LLCs, etc.), they are not a staple article or commodity of commerce suitable for substantial non-infringing use.

81. In addition, Intel offers to sell and sells the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities to Original Equipment Manufacturers (OEMs) and/or Original Design Manufacturers (ODMs) who then incorporate the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities into infringing products which are used, sold, offered for sale, and/or imported in the United States in an infringing manner. Accordingly, Intel is liable as a contributory infringer.

82. In the alternative, to the extent Intel does not meet all of the limitations of the '872 Patent by making the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities in the United States, Intel infringes under 35 U.S.C. § 271(f)(1) and (f)(2) by supplying from the United States a substantial portion of the components of the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities (for example, structures or components contained in semiconductor wafers or dies or the like), and actively induces the combination of components outside the United States in a manner that would infringe the '872 Patent (for example, by packaging or assembly, or by incorporation into desktop computers, laptops, servers, tablets, or the like by ODMs or OEMs). Intel further supplies from the United States components which are especially made and especially adapted for use in practicing the '872 Patent, and not staple articles or a commodity of commerce

suitable for substantial non-infringing use (for example, structures or components contained in semiconductor wafers or dies or the like). Intel knows the components are especially made and especially adapted to be combined outside of the United States in a manner that would infringe the '872 Patent (for example, by packaging or assembly, or by incorporation into desktop computers, laptops, servers, tablets, or the like by ODMs or OEMs). Based on these facts and the facts set forth in the paragraphs above, Intel infringes the '872 Patent under 35 U.S.C. § 271(f)(1) and (f)(2).

83. As a result of Intel's infringement of the '872 Patent, PACT has been damaged. PACT is entitled to recover for damages sustained as a result of Intel's wrongful acts in an amount subject to proof at trial but no less than a reasonable royalty.

84. In addition, Intel's infringing acts and practices have caused and are causing immediate and irreparable harm to PACT.

85. PACT is informed and believes, and thereon alleges, that the infringement of the '872 Patent by Intel has been and continues to be willful. As noted above, at least as of the service of the Complaint in PACT XPP Schweiz AG v. Intel Corporation, 1-19-cv-00267 (DED), Intel has actual knowledge of its infringement of the '872 Patent. Intel has deliberately continued to infringe in a wanton, malicious, and egregious manner, with reckless disregard for PACT's patent rights. Thus, Intel's infringing actions have been and continue to be consciously wrongful, entitling PACT to increased damages under 35 U.S.C. § 284.

86. PACT is informed and believes, and thereon alleges, that this is an exceptional case, which warrants an award of attorney's fees to PACT pursuant to 35 U.S.C. § 285.

**COUNT III – INFRINGEMENT OF U.S. PATENT NO. 8,312,301**

87. PACT incorporates each of the above paragraphs 1-35 as though fully set forth herein.

88. PACT is informed and believes, and thereon alleges, that Intel has infringed and unless enjoined will continue to infringe one or more claims of the '301 Patent, in violation of 35 U.S.C. § 271, by, among other things, making, using (including testing), offering to sell, and selling within the United States, supplying or causing to be supplied in or from the United States, and importing into the United States, without authority or license, Intel products with the infringing features, including Intel processors with Turbo Boost feature (the "Accused Turbo Boost Instrumentalities").

89. For example, the Accused Turbo Boost Instrumentalities embody every limitation of at least claim 10 of the '301 Patent, literally or under the doctrine of equivalents, as set forth below. The further descriptions below, which are based on publicly available information, are preliminary examples and are non-limiting.

***"A processor device, comprising"***

90. The Accused Turbo Boost Instrumentalities are processors incorporated on a chip, thus, constitute a processor device.

***"a plurality of data processing elements; and"***

91. The Accused Turbo Boost Instrumentalities include a plurality of data processing elements because they are multi-core processors.

***"a software adapted to be executed to (a) manage distribution of code sections, each code section to be executed by a respective group of a subset of the plurality of data processing elements"***

92. The Turbo Boost Max Technology 3.0 Application / Driver working with the Accused Turbo Boost Instrumentalities is adapted to be executed to manage distribution of applications. A targeted application runs on the higher frequency core and the remaining applications run on other cores.

***“(b) assign to each of the code sections a respective clock frequency”***

93. The Turbo Boost Max Technology 3.0 Application / Driver working with the Accused Turbo Boost Instrumentalities is adapted to be executed to assign to certain applications different clock frequencies because the cores where the applications run have different frequencies according to Turbo Boost Max Technology 3.0.

***“the group of data processing elements executing the respective code sections at the respective clock frequencies”***

94. The Accused Turbo Boost Instrumentalities include multiple cores executing the targeted applications and regular applications at different frequencies according to Turbo Boost Max Technology 3.0.

95. In violation of 35 U.S.C. § 271, Intel has infringed and is currently infringing, directly and/or through intermediaries, the '301 Patent by making, using, selling, offering for sale, and/or importing into the United States, without authority, products that practice at least claim 10 of the '301 Patent. These products include the Accused Turbo Boost Instrumentalities, and any other products that incorporate the Accused Turbo Boost Instrumentalities. Intel has infringed and is currently infringing literally and/or under the doctrine of equivalents.

96. To the extent the method claims of the '301 Patent are also performed by Intel's customers, end users and/or other intermediaries, Intel infringes because the customers, the end users, and/or the intermediaries using the products Intel manufactures can only use said products if using programming steps provided by Intel and under the terms prescribed by Intel, because Intel through its programming and manufactures controls the method whereby users are able to use the infringing processors, and because Intel conditions receipt of the benefit of the accused

feature upon performance of the steps of the patented method(s) and establishes the manner and/or timing of that performance, and Intel is thus liable under Section 271(a).

97. On information and belief, PACT asserts that Intel was aware of this patent before this lawsuit was filed, and at least as of the service of the Complaint in PACT XPP Schweiz AG v. Intel Corporation, 1-19-cv-00267 (DED), Intel had actual knowledge of its infringement of the '301 Patent.

98. PACT is informed and believes, and thereon alleges, that Intel, subsequent to the time it first learned of the '301 Patent and at least as of the time of service of the Complaint in PACT XPP Schweiz AG v. Intel Corporation, 1-19-cv-00267 (DED), specifically intended to induce patent infringement by third-party original equipment manufacturers (OEMs), customers, and users of the Accused Turbo Boost Instrumentalities and had knowledge that the inducing acts would cause infringement or is willfully blind to the possibility that their inducing acts would cause infringement. Intel has sold and continues to sell the Accused Turbo Boost Instrumentalities to OEMs making OEM products (*e.g.*, computers, servers, laptops, tablets, etc.), knowing that the Accused Turbo Boost Instrumentalities will be included in the OEM products and sold to customers in the United States in violation of U.S. patent law, and/or to original design manufacturers (ODMs), knowing that the Accused Turbo Boost Instrumentalities will ultimately be included in OEM products and sold to customers in the United States.

99. Indeed, Intel's "Intel Inside" campaign has informed customers through advertising and stickers on the OEM products themselves that the products contain the Accused Turbo Boost Instrumentalities. Intel also knows that many such OEM products that contain the Accused Turbo Boost Instrumentalities are made outside the United States and are imported into the United States in violation of U.S. patent law. Intel also knows that U.S. customers of the OEMs use the OEM

products containing the Accused Turbo Boost Instrumentalities in the United States in violation of U.S. patent law.

100. Intel also publicly provides documentation, including datasheets available through Intel's publicly accessible ARK service and software developer's manuals, instructing customers on uses of Intel's products that infringe the '301 Patent. *See, e.g.*, <http://ark.intel.com>. In addition, Intel specifically advertises and promotes the infringing use of Intel's products, including the Turbo Boost Max Technology 3.0 feature. *See, e.g.*, <https://www.intel.com/content/www/us/en/support/articles/000021587/processors.html>.

101. On information and belief, Intel's customers directly infringe the '301 Patent by, for example, making, using, offering to sell, and selling within the United States, and importing into the United States, without authority or license, products containing the Accused Turbo Boost Instrumentalities.

102. Intel contributes to the infringement of the '301 Patent in violation of 35 U.S.C. § 271(c). As stated above, on information and belief Intel was aware of the '301 Patent before this lawsuit was filed but Intel was aware of the '301 Patent at least as of the time of service of the Complaint in PACT XPP Schweiz AG v. Intel Corporation, 1-19-cv-00267 (DED). Intel thus offers to sell and sells within the United States the Accused Turbo Boost Instrumentalities knowing that those products constitute a material part of the claimed invention because Intel incorporates the accused components (multi-cores with Turbo Boost Max Technology 3.0 capability, etc.) into the Accused Turbo Boost Instrumentalities.

103. Intel knows that the Accused Turbo Boost Instrumentalities are especially made or especially adapted for use in infringing the '301 Patent because the Accused Turbo Boost Instrumentalities all contain the infringing components (multi-cores with Turbo Boost Max

Technology 3.0 capability, etc.). Furthermore, because the Accused Turbo Boost Instrumentalities contain the infringing components (multi-cores with Turbo Boost Max Technology 3.0 capability, etc.) and Intel actively promotes the infringing use and offers download of infringing software, *see, e.g.,* <https://www.intel.com/content/www/us/en/architecture-and-technology/turbo-boost/turbo-boost-max-technology.html> and <https://www.intel.com/content/www/us/en/support/articles/000021587/processors.html>, on information and belief, the non-infringement use, if any, is not substantial and the Accused Turbo Boost Instrumentalities are not a staple article or commodity of commerce suitable for substantial non-infringing use.

104. In addition, Intel offers to sell and sells the Accused Turbo Boost Instrumentalities to Original Equipment Manufacturers (OEMs) and/or Original Design Manufacturers (ODMs) who then incorporate the Accused Turbo Boost Instrumentalities into infringing products which are used, sold, offered for sale, and/or imported in the United States in an infringing manner. Accordingly, Intel is liable as a contributory infringer.

105. In the alternative, to the extent Intel does not meet all of the limitations of the '301 Patent by making the Accused Turbo Boost Instrumentalities in the United States, Intel infringes under 35 U.S.C. § 271(f)(1) and (f)(2) by supplying from the United States a substantial portion of the components of the Accused Turbo Boost Instrumentalities (for example, structures or components contained in semiconductor wafers or dies or the like), and actively induces the combination of components outside the United States in a manner that would infringe the '301 Patent (for example, by packaging or assembly, or by incorporation into desktop computers, laptops, servers, tablets, or by installing certain software, or the like by ODMs, OEMs, and/or end users). Intel further supplies from the United States components which are especially made and

especially adapted for use in practicing the '301 Patent, and not staple articles or a commodity of commerce suitable for substantial non-infringing use (for example, structures or components contained in semiconductor wafers or dies or the like). Intel knows the components are especially made and especially adapted to be combined outside of the United States in a manner that would infringe the '301 Patent (for example, by packaging or assembly, or by incorporation into desktop computers, laptops, servers, tablets, or by installing certain software, or the like by ODMs, OEMs, and/or end users). Based on these facts and the facts set forth in the paragraphs above, Intel infringes the '301 Patent under 35 U.S.C. § 271(f)(1) and (f)(2).

106. As a result of Intel's infringement of the '301 Patent, PACT has been damaged. PACT is entitled to recover for damages sustained as a result of Intel's wrongful acts in an amount subject to proof at trial but no less than a reasonable royalty.

107. In addition, Intel's infringing acts and practices have caused and are causing immediate and irreparable harm to PACT.

108. PACT is informed and believes, and thereon alleges, that the infringement of the '301 Patent by Intel has been and continues to be willful. As noted above, at least as of the service of the Complaint in PACT XPP Schweiz AG v. Intel Corporation, 1-19-cv-00267 (DED), Intel has actual knowledge of its infringement of the '301 Patent. Intel has deliberately continued to infringe in a wanton, malicious, and egregious manner, with reckless disregard for PACT's patent rights. Thus, Intel's infringing actions have been and continue to be consciously wrongful, entitling PACT to increased damages under 35 U.S.C. § 284.

109. PACT is informed and believes, and thereon alleges, that this is an exceptional case, which warrants an award of attorney's fees to PACT pursuant to 35 U.S.C. § 285.

**COUNT IV – INFRINGEMENT OF U.S. PATENT NO. 8,471,593**

110. PACT incorporates each of the above paragraphs 1-35 as though fully set forth herein.

111. PACT is informed and believes, and thereon alleges, that Intel has infringed and unless enjoined will continue to infringe one or more claims of the '593 Patent, in violation of 35 U.S.C. § 271, by, among other things, making, using (including testing), offering to sell, and selling within the United States, supplying or causing to be supplied in or from the United States, and importing into the United States, without authority or license, Intel products with the infringing features, including the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities.

112. For example, the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities embody every limitation of at least claim 1 of the '593 Patent, literally or under the doctrine of equivalents, as set forth below. The further descriptions below, which are based on publicly available information, are preliminary examples and are non-limiting.

***“A data processor on a chip comprising”***

113. The Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities are processors incorporated on a chip, thus, constitute data processor on a chip.

***“a plurality of data processing cores, each of at least some of the processing cores including: at least one arithmetic logic unit that supports at least division and multiplication of at least 32-bit wide data; and at least 3 registers for storing at least 32-bit wide data”***

114. The Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities are multi-core processors including ALUs capable of 32-bit wide division and multiplication and at least 3 general purpose registers being at least 32-bit wide.  
***“a plurality of memory units to buffer at least 32-bit wide data”***

115. The Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities include Last Level Caches with line size at least 32-bit to buffer data.

***“at least one interface unit for providing at least one communication channel between the data processor and external memory, and”***

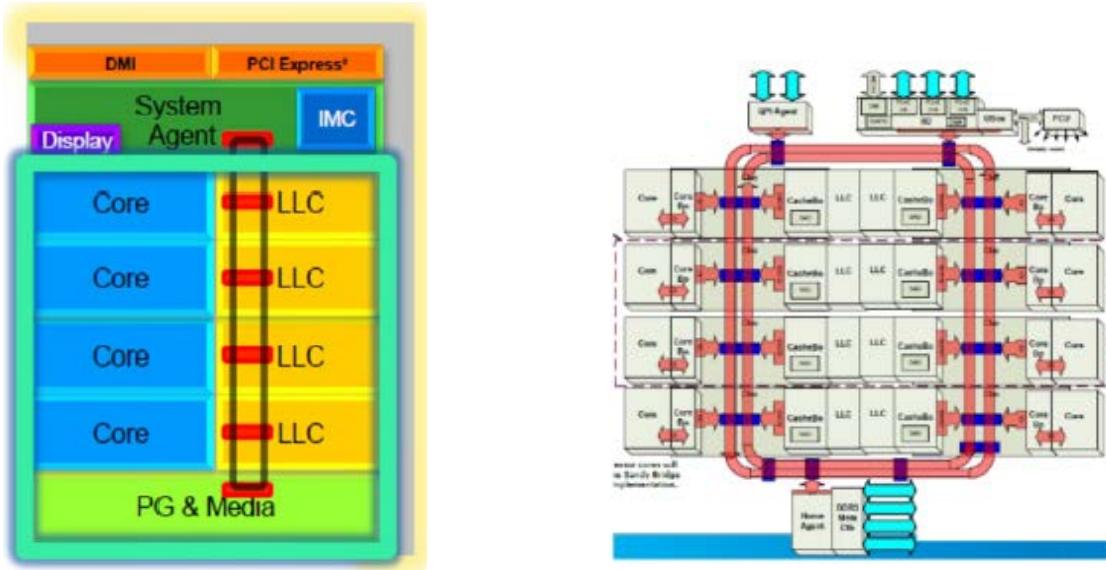
116. The Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities include a System Agent working with the ring bus system (or equivalents) for providing at least one communication channel between the core and external memory such as RAM and/or various types of DRAMs.

***“a bus system flexibly interconnecting the plurality of processing cores, the plurality of memory units, and the at least one interface”***

117. The Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities include at least a ring bus system (or equivalents) flexibly interconnecting the cores, LLCs, and the System Agent, etc.

***“wherein: the bus system includes a first structure dedicated for data transfer in a first direction and a second structure dedicated for data transfer in a second direction, and”***

118. In the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities, the above identified ring bus system (or equivalents) transfers data in at least two directions with two structures as shown in the two figures below:



*“each of at least some of the data processing cores includes a physically dedicated connection to at least one physically assigned one of the plurality of memory units, the assigned one of the plurality of memory units being accessible by another of the data processing cores via a secondary bus path of the bus system”*

119. In the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities, each core includes a physically dedicated connection to at least one physically assigned LLC as shown in the two figures above. The assigned LLC is accessible by another core via a secondary bus path of the ring bus system (or equivalents) as shown in the two figures above.

120. In violation of 35 U.S.C. § 271, Intel has infringed and is currently infringing, directly and/or through intermediaries, the '593 Patent by making, using, selling, offering for sale, and/or importing into the United States, without authority, products that practice at least claim 1 of the '593 Patent. These products include the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities, and any other products that incorporate the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the

Accused Celeron Instrumentalities. Intel has infringed and is currently infringing literally and/or under the doctrine of equivalents.

121. On information and belief, PACT asserts that Intel was aware of this patent before this lawsuit was filed, and at least as of the service of the Complaint in PACT XPP Schweiz AG v. Intel Corporation, 1-19-cv-00267 (DED), Intel had actual knowledge of its infringement of the '593 Patent.

122. PACT is informed and believes, and thereon alleges, that Intel, subsequent to the time it first learned of the '593 Patent and at least as of the time of service of the Complaint in PACT XPP Schweiz AG v. Intel Corporation, 1-19-cv-00267 (DED), specifically intended to induce patent infringement by third-party original equipment manufacturers (OEMs), customers, and users of the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities and had knowledge that the inducing acts would cause infringement or is willfully blind to the possibility that their inducing acts would cause infringement. Intel has sold and continues to sell the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities to OEMs making OEM products (*e.g.*, computers, servers, laptops, tablets, etc.), knowing that the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities will be included in the OEM products and sold to customers in the United States in violation of U.S. patent law, and/or to original design manufacturers (ODMs), knowing that the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities will ultimately be included in OEM products and sold to customers in the United States.

123. Indeed, Intel's "Intel Inside" campaign has informed customers through advertising and stickers on the OEM products themselves that the products contain the Accused Core

Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities. Intel also knows that many such OEM products that contain the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities are made outside the United States and are imported into the United States in violation of U.S. patent law. Intel also knows that U.S. customers of the OEMs use the OEM products containing the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities in the United States in violation of U.S. patent law.

124. Intel also publicly provides documentation, including datasheets available through Intel's publicly accessible ARK service and software developer's manuals, instructing customers on uses of Intel's products that infringe the '593 Patent. *See, e.g.,* <http://ark.intel.com>. In addition, Intel specifically advertises and promotes the infringing use of Intel's products, including the ring bus system and its equivalent. *See, e.g.,* <https://software.intel.com/en-us/articles/how-memory-is-accessed>.

125. On information and belief, Intel's customers directly infringe the '593 Patent by, for example, making, using, offering to sell, and selling within the United States, and importing into the United States, without authority or license, products containing the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities.

126. Intel contributes to the infringement of the '593 Patent in violation of 35 U.S.C. § 271(c). As stated above, on information and belief Intel was aware of the '593 Patent before this lawsuit was filed but Intel was aware of the '593 Patent at least as of the time of service of the Complaint in PACT XPP Schweiz AG v. Intel Corporation, 1-19-cv-00267 (DED). Intel thus offers to sell and sells within the United States the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities knowing that those products

constitute a material part of the claimed invention because Intel incorporates the accused components (ring bus system, multi-cores, LLCs, etc.) into the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities.

127. Intel knows that the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities are especially made or especially adapted for use in infringing the '593 Patent because the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities all contain the infringing components (ring bus system, multi-cores, LLCs, etc.). Furthermore, because the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities contain the infringing components (ring bus system, multi-cores, LLCs, etc.), they are not a staple article or commodity of commerce suitable for substantial non-infringing use.

128. In addition, Intel offers to sell and sells the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities to Original Equipment Manufacturers (OEMs) and/or Original Design Manufacturers (ODMs) who then incorporate the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities into infringing products which are used, sold, offered for sale, and/or imported in the United States in an infringing manner. Accordingly, Intel is liable as a contributory infringer.

129. In the alternative, to the extent Intel does not meet all of the limitations of the '593 Patent by making the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities in the United States, Intel infringes under 35 U.S.C. § 271(f)(1) and (f)(2) by supplying from the United States a substantial portion of the components of the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities (for example, structures or components contained in semiconductor

wafers or dies or the like), and actively induces the combination of components outside the United States in a manner that would infringe the '593 Patent (for example, by packaging or assembly, or by incorporation into desktop computers, laptops, servers, tablets, or the like by ODMs or OEMs). Intel further supplies from the United States components which are especially made and especially adapted for use in practicing the '593 Patent, and not staple articles or a commodity of commerce suitable for substantial non-infringing use (for example, structures or components contained in semiconductor wafers or dies or the like). Intel knows the components are especially made and especially adapted to be combined outside of the United States in a manner that would infringe the '593 Patent (for example, by packaging or assembly, or by incorporation into desktop computers, laptops, servers, tablets, or the like by ODMs or OEMs). Based on these facts and the facts set forth in the paragraphs above, Intel infringes the '593 Patent under 35 U.S.C. § 271(f)(1) and (f)(2).

130. As a result of Intel's infringement of the '593 Patent, PACT has been damaged. PACT is entitled to recover for damages sustained as a result of Intel's wrongful acts in an amount subject to proof at trial but no less than a reasonable royalty.

131. In addition, Intel's infringing acts and practices have caused and are causing immediate and irreparable harm to PACT.

132. PACT is informed and believes, and thereon alleges, that the infringement of the '593 Patent by Intel has been and continues to be willful. As noted above, at least as of the service of the Complaint in PACT XPP Schweiz AG v. Intel Corporation, 1-19-cv-00267 (DED), Intel has actual knowledge of its infringement of the '593 Patent. Intel has deliberately continued to infringe in a wanton, malicious, and egregious manner, with reckless disregard for PACT's

patent rights. Thus, Intel's infringing actions have been and continue to be consciously wrongful, entitling PACT to increased damages under 35 U.S.C. § 284.

133. PACT is informed and believes, and thereon alleges, that this is an exceptional case, which warrants an award of attorney's fees to PACT pursuant to 35 U.S.C. § 285.

**COUNT V – INFRINGEMENT OF U.S. PATENT NO. 8,686,549**

134. PACT incorporates each of the above paragraphs 1-35 as though fully set forth herein.

135. PACT is informed and believes, and thereon alleges, that Intel has infringed and unless enjoined will continue to infringe one or more claims of the '549 Patent, in violation of 35 U.S.C. § 271, by, among other things, making, using (including testing), offering to sell, and selling within the United States, supplying or causing to be supplied in or from the United States, and importing into the United States, without authority or license, Intel products with the infringing features, including the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, Celeron processors, Atom processors, and/or other products comprising active interposer(s) interconnecting multiple dies and/or processors, including, but not limited to, Intel chips and/or chiplets implementing Foveros technology, such as Lakefield (the "Accused Stacking Instrumentalities").

136. For example, the Accused Stacking Instrumentalities embody every limitation of at least claim 39 of the '549 Patent, literally or under the doctrine of equivalents, as set forth below. The further descriptions below, which are based on publicly available information, are preliminary examples and are non-limiting.

***"A processor integrated device, comprising"***

137. The Accused Stacking Instrumentalities are integrated circuits as well as data processors, and thus a processor integrated device.

***“at least two dies that are stacked”***

138. The Accused Stacking Instrumentalities include at least two dies that are stacked, shown as “Computer Chip,” “Active Interposer,” and “Memory, Modem” below:



***“an interconnect structure; and”***

139. The Accused Stacking Instrumentalities include an active interposer and thus comprise an interconnect structure.

***“an arrangement of programmable data processing units interconnected by the interconnect structure”***

140. In the Accused Stacking Instrumentalities, the processing cores, as well as other type of programmable data processing units, are interconnected by the active interposer, which constitutes an arrangement of programmable data processing units interconnected by the interconnect structure.

***“wherein: at least some of the programmable data processing units include Arithmetic Logic Units (ALUs)”***

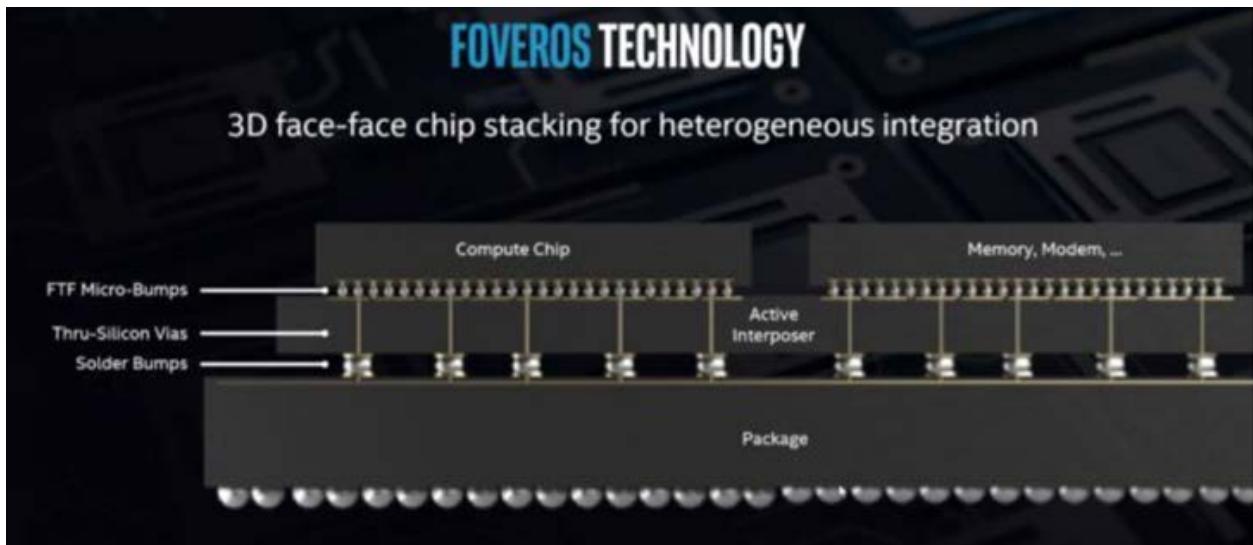
141. The processing cores in the Accused Stacking Instrumentalities include Arithmetic Logic Units (ALUs), and thus the at least some of the programmable data processing units include Arithmetic Logic Units (ALUs).

***“the interconnect structure includes switches”***

142. The active interposer in the Accused Stacking Instrumentalities includes I/O, SRAM, power deliver circuits, and/or PCH, and thus includes switches.

***“the programmable data processing units are implemented on at least a first one of the at least two dies; and”***

143. Intel processing cores in the Accused Stacking Instrumentalities are implemented on at least the “Computer Chip” die shown below, and thus are implemented on at least a first one of the at least two dies.



***“at least parts of the interconnect structure are implemented on at least a second one of the at least two dies.”***

144. The active interposer parts in the Accused Stacking Instrumentalities are implemented on the “Active Interposer” die shown below, and thus are implemented on at least a second one of the at least two dies.

145. In violation of 35 U.S.C. § 271, Intel has infringed and is currently infringing, directly and/or through intermediaries, the '549 Patent by making, using, selling, offering for sale, and/or importing into the United States, without authority, products that practice at least claim 39 of the '549 Patent. These products include the Accused Stacking Instrumentalities, and any other products that incorporate the Accused Stacking Instrumentalities. Intel has infringed and is currently infringing literally and/or under the doctrine of equivalents.

146. On information and belief, PACT asserts that Intel was aware of this patent before this lawsuit was filed, and at least as of the service of the Complaint in PACT XPP Schweiz AG v. Intel Corporation, 1-19-cv-00267 (DED), Intel had actual knowledge of its infringement of the '549 Patent.

147. PACT is informed and believes, and thereon alleges, that Intel, subsequent to the time it first learned of the '549 Patent and at least as of the time of service of the Complaint in PACT XPP Schweiz AG v. Intel Corporation, 1-19-cv-00267 (DED), specifically intended to induce patent infringement by third-party original equipment manufacturers (OEMs), customers, and users of the Accused Stacking Instrumentalities and had knowledge that the inducing acts would cause infringement or is willfully blind to the possibility that their inducing acts would cause infringement. Intel has sold and/or offered to sell the Accused Stacking Instrumentalities to OEMs making OEM products (*e.g.*, computers, laptops, servers, etc.), knowing that the Accused Stacking Instrumentalities will be included in the OEM products and sold to customers in the United States in violation of U.S. patent law, and/or to original design manufacturers (ODMs), knowing that the Accused Stacking Instrumentalities will ultimately be included in OEM products and sold to customers in the United States.

148. Indeed, Intel has informed customers through at least Intel's Architecture Day in December 2018 and the CES 2019 Conference that the products contain the Accused Stacking Instrumentalities. Intel also knows that many such OEM products that contain the Accused Stacking Instrumentalities are made and/or to be made outside the United States and are imported and/or to be imported into the United States in violation of U.S. patent law. Intel also knows that U.S. customers of the OEMs use the OEM products containing the Accused Stacking Instrumentalities in the United States in violation of U.S. patent law.

149. Intel also publicly provides documentation through at least Intel's Architecture Day presentation and CES 2019 Conference to public, instructing customers on uses of Intel's products that infringe the '549 Patent. In addition, Intel specifically advertises and promotes the infringing use of Intel's products, including the Foveros technology. *See, e.g.,* <https://newsroom.intel.com/articles/new-intel-architectures-technologies-target-expanded-market-opportunities/#gs.uIfUyfYJ>.

150. On information and belief, Intel's personnel and/or customers directly infringe the '549 Patent by, for example, using, testing, offering to sell, and selling within the United States, and/or importing into the United States, without authority or license, products containing the Accused Stacking Instrumentalities.

151. Intel contributes to the infringement of the '549 Patent in violation of 35 U.S.C. § 271(c). As stated above, on information and belief Intel was aware of the '549 Patent before this lawsuit was filed but Intel was aware of the '549 Patent at least as of the time of service of the Complaint in PACT XPP Schweiz AG v. Intel Corporation, 1-19-cv-00267 (DED). Intel thus offers to sell and/or sells within the United States the Accused Stacking Instrumentalities knowing that those products constitute a material part of the claimed invention because Intel incorporates

the accused components (Foveros structures, active interposers, etc.) into the Accused Stacking Instrumentalities.

152. Intel knows that the Accused Stacking Instrumentalities are especially made or especially adapted for use in infringing the '549 Patent because the Accused Stacking Instrumentalities all contain the infringing components (Foveros structures, active interposers, etc.). Furthermore, because the Accused Stacking Instrumentalities contain the infringing components (Foveros structures, active interposers, etc.), they are not a staple article or commodity of commerce suitable for substantial non-infringing use.

153. In addition, Intel offers to sell and/or sells the Accused Stacking Instrumentalities to Original Equipment Manufacturers (OEMs) and/or Original Design Manufacturers (ODMs) who then incorporate the Accused Stacking Instrumentalities into infringing products which are used, sold, offered for sale, and/or imported in the United States in an infringing manner. Accordingly, Intel is liable as a contributory infringer.

154. In the alternative, to the extent Intel does not meet all of the limitations of the '549 Patent by making the Accused Stacking Instrumentalities in the United States, Intel infringes under 35 U.S.C. § 271(f)(1) and (f)(2) by supplying from the United States a substantial portion of the components of the Accused Stacking Instrumentalities (for example, structures or components contained in semiconductor wafers or dies or the like), and actively induces the combination of components outside the United States in a manner that would infringe the '549 Patent (for example, by packaging or assembly, or by incorporation into desktop computers, laptops, servers or the like by ODMs or OEMs). Intel further supplies from the United States components which are especially made and especially adapted for use in practicing the '549 Patent, and not staple articles or a commodity of commerce suitable for substantial non-infringing use (for example, structures

or components contained in semiconductor wafers or dies or the like). Intel knows the components are especially made and especially adapted to be combined outside of the United States in a manner that would infringe the '549 Patent (for example, by packaging or assembly, or by incorporation into desktop computers, laptops, servers or the like by ODMs or OEMs). Based on these facts and the facts set forth in the paragraphs above, Intel infringes the '549 Patent under 35 U.S.C. § 271(f)(1) and (f)(2).

155. As a result of Intel's infringement of the '549 Patent, PACT has been damaged. PACT is entitled to recover for damages sustained as a result of Intel's wrongful acts in an amount subject to proof at trial but no less than a reasonable royalty.

156. In addition, Intel's infringing acts and practices have caused and are causing immediate and irreparable harm to PACT.

157. PACT is informed and believes, and thereon alleges, that the infringement of the '549 Patent by Intel has been and continues to be willful. As noted above, at least as of the service of the Complaint in PACT XPP Schweiz AG v. Intel Corporation, 1-19-cv-00267 (DED), Intel has actual knowledge of its infringement of the '549 Patent. Intel has deliberately continued to infringe in a wanton, malicious, and egregious manner, with reckless disregard for PACT's patent rights. Thus, Intel's infringing actions have been and continue to be consciously wrongful, entitling PACT to increased damages under 35 U.S.C. § 284.

158. PACT is informed and believes, and thereon alleges, that this is an exceptional case, which warrants an award of attorney's fees to PACT pursuant to 35 U.S.C. § 285.

**COUNT VI – INFRINGEMENT OF U.S. PATENT NO. 8,819,505**

159. PACT incorporates each of the above paragraphs 1-35 as though fully set forth herein.

160. PACT is informed and believes, and thereon alleges, that Intel has infringed and unless enjoined will continue to infringe one or more claims of the '505 Patent, in violation of 35 U.S.C. § 271, by, among other things, making, using (including testing), offering to sell, and selling within the United States, supplying or causing to be supplied in or from the United States, and importing into the United States, without authority or license, Intel products with the infringing features, including the Intel multi-core processors (the "Accused '505 Instrumentalities").

161. For example, the Accused '505 Instrumentalities embody every limitation of at least claim 27 of the '505 Patent, literally or under the doctrine of equivalents, as set forth below. The further descriptions below, which are based on publicly available information, are preliminary examples and are non-limiting.

***"An Integrated Circuit Data Processor comprising"***

162. The Accused '505 Instrumentalities are data processors on an integrated circuit and thus integrated circuit data processors.

***"a bus system"***

163. The Accused '505 Instrumentalities include a ring bus system (or equivalents) that constitutes a bus system.

***"a plurality of data processing cores; each of the plurality of data processing cores comprises at least one Arithmetic and Logic unit"***

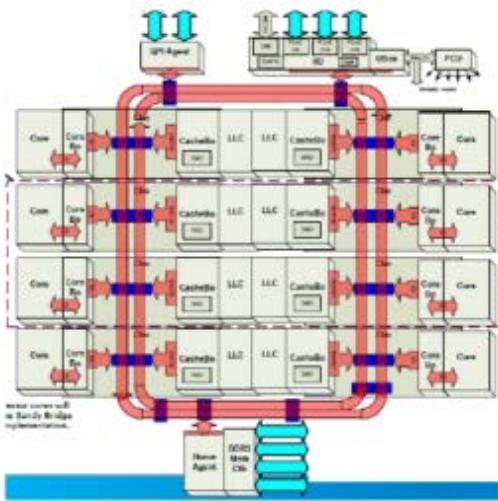
164. The Accused '505 Instrumentalities are multi-core processors and each of the core includes at least one ALU.

***"wherein the plurality of data processing cores are arranged in an arrangement having columns, the number of columns being larger than two, and the number of data processing cores in each column being larger than two"***

165. On information and belief, the Accused Xeon Processors with nine or more cores have the cores arranged in at least three columns with at least three cores in each column.

***“the bus system interconnects the plurality of data processing cores in the arrangement for transferring data between the data processing core; and.”***

166. In the Accused '505 Instrumentalities, the ring bus system (or equivalents) interconnects the processing cores and transfers data between them in substantially the same way as shown in the figure below.



***“wherein, in view of a probability of the chip having defects already when being manufactured, more of the plurality of data processing cores are implemented than used, so that some of the data processing cores can be exempted from data transfer via the bus system in response to a chip test.”***

167. On information and belief, certain cores in the Accused '505 Instrumentalities are turned off because of probability of defects generated during manufacture, which would cause more cores are implemented than used, and the cores that are turned off can be exempted from data transfer via the ring bus system (or equivalents) in response to a chip test.

168. In violation of 35 U.S.C. § 271, Intel has infringed and is currently infringing, directly and/or through intermediaries, the '505 Patent by making, using, selling, offering for sale, and/or importing into the United States, without authority, products that practice at least claim 27 of the '505 Patent. These products include the Accused '505 Instrumentalities, and any other products that incorporate the Accused '505 Instrumentalities. Intel has infringed and is currently infringing literally and/or under the doctrine of equivalents.

169. On information and belief, PACT asserts that Intel was aware of this patent before this lawsuit was filed, and at least as of the service of the Complaint in PACT XPP Schweiz AG v. Intel Corporation, 1-19-cv-00267 (DED), Intel had actual knowledge of its infringement of the '505 Patent.

170. PACT is informed and believes, and thereon alleges, that Intel, subsequent to the time it first learned of the '505 Patent and at least as of the time of service of the Complaint in PACT XPP Schweiz AG v. Intel Corporation, 1-19-cv-00267 (DED), specifically intended to induce patent infringement by third-party original equipment manufacturers (OEMs), customers, and users of the Accused '505 Instrumentalities and had knowledge that the inducing acts would cause infringement or is willfully blind to the possibility that their inducing acts would cause infringement. Intel has sold and continues to sell the Accused '505 Instrumentalities to OEMs making OEM products (*e.g.*, servers, etc.), knowing that the Accused '505 Instrumentalities will be included in the OEM products and sold to customers in the United States in violation of U.S. patent law, and/or to original design manufacturers (ODMs), knowing that the Accused '505 Instrumentalities will ultimately be included in OEM products and sold to customers in the United States.

171. Indeed, Intel's "Intel Inside" campaign has informed customers through advertising and stickers on the OEM products themselves that the products contain the Accused '505 Instrumentalities. Intel also knows that many such OEM products that contain the Accused '505 Instrumentalities are made outside the United States and are imported into the United States in violation of U.S. patent law. Intel also knows that U.S. customers of the OEMs use the OEM products containing the Accused '505 Instrumentalities in the United States in violation of U.S. patent law.

172. Intel also publicly provides documentation, including datasheets available through Intel's publicly accessible ARK service and software developer's manuals, instructing customers on uses of Intel's products that infringe the '505 Patent. *See, e.g.,* <http://ark.intel.com>.

173. On information and belief, Intel's customers directly infringe the '505 Patent by, for example, making, using, offering to sell, and selling within the United States, and importing into the United States, without authority or license, products containing the Accused '505 Instrumentalities.

174. Intel contributes to the infringement of the '505 Patent in violation of 35 U.S.C. § 271(c). As stated above, on information and belief Intel was aware of the '505 Patent before this lawsuit was filed but Intel was aware of the '505 Patent at least as of the time of service of the Complaint in PACT XPP Schweiz AG v. Intel Corporation, 1-19-cv-00267 (DED). Intel thus offers to sell and sells within the United States the Accused '505 Instrumentalities knowing that those products constitute a material part of the claimed invention because Intel incorporates the accused components (ring bus system, multi-cores, etc.) into the Accused '505 Instrumentalities.

175. Intel knows that the Accused '505 Instrumentalities are especially made or especially adapted for use in infringing the '505 Patent because the Accused '505 Instrumentalities

all contain the infringing components (ring bus system, multi-cores, etc.). Furthermore, because the Accused '505 Instrumentalities contain the infringing components (ring bus system, multi-cores, etc.), they are not a staple article or commodity of commerce suitable for substantial non-infringing use.

176. In addition, Intel offers to sell and sells the Accused '505 Instrumentalities to Original Equipment Manufacturers (OEMs) and/or Original Design Manufacturers (ODMs) who then incorporate the Accused '505 Instrumentalities into infringing products which are used, sold, offered for sale, and/or imported in the United States in an infringing manner. Accordingly, Intel is liable as a contributory infringer.

177. In the alternative, to the extent Intel does not meet all of the limitations of the '505 Patent by making the Accused '505 Instrumentalities in the United States, Intel infringes under 35 U.S.C. § 271(f)(1) and (f)(2) by supplying from the United States a substantial portion of the components of the Accused '505 Instrumentalities (for example, structures or components contained in semiconductor wafers or dies or the like), and actively induces the combination of components outside the United States in a manner that would infringe the '505 Patent (for example, by packaging or assembly, or by incorporation into servers or the like by ODMs or OEMs). Intel further supplies from the United States components which are especially made and especially adapted for use in practicing the '505 Patent, and not staple articles or a commodity of commerce suitable for substantial non-infringing use (for example, structures or components contained in semiconductor wafers or dies or the like). Intel knows the components are especially made and especially adapted to be combined outside of the United States in a manner that would infringe the '505 Patent (for example, by packaging or assembly, or by incorporation into servers or the

like by ODMs or OEMs). Based on these facts and the facts set forth in the paragraphs above, Intel infringes the '505 Patent under 35 U.S.C. § 271(f)(1) and (f)(2).

178. As a result of Intel's infringement of the '505 Patent, PACT has been damaged. PACT is entitled to recover for damages sustained as a result of Intel's wrongful acts in an amount subject to proof at trial but no less than a reasonable royalty.

179. In addition, Intel's infringing acts and practices have caused and are causing immediate and irreparable harm to PACT.

180. PACT is informed and believes, and thereon alleges, that the infringement of the '505 Patent by Intel has been and continues to be willful. As noted above, at least as of the service of the Complaint in PACT XPP Schweiz AG v. Intel Corporation, 1-19-cv-00267 (DED), Intel has actual knowledge of its infringement of the '505 Patent. Intel has deliberately continued to infringe in a wanton, malicious, and egregious manner, with reckless disregard for PACT's patent rights. Thus, Intel's infringing actions have been and continue to be consciously wrongful, entitling PACT to increased damages under 35 U.S.C. § 284.

181. PACT is informed and believes, and thereon alleges, that this is an exceptional case, which warrants an award of attorney's fees to PACT pursuant to 35 U.S.C. § 285.

#### **COUNT VII – INFRINGEMENT OF U.S. PATENT NO. 9,037,807**

182. PACT incorporates each of the above paragraphs 1-35 as though fully set forth herein.

183. PACT is informed and believes, and thereon alleges, that Intel has infringed and unless enjoined will continue to infringe one or more claims of the '807 Patent, in violation of 35 U.S.C. § 271, by, among other things, making, using (including testing), offering to sell, and selling within the United States, supplying or causing to be supplied in or from the United States, and importing into the United States, without authority or license, Intel products with the infringing

features, including the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities.

184. For example, the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities embody every limitation of at least claim 1 of the '807 Patent, literally or under the doctrine of equivalents, as set forth below. The further descriptions below, which are based on publicly available information, are preliminary examples and are non-limiting.

***“A multi-processor system on a chip. comprising”***

185. The Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities are each a multi-processor system on a chip because they include multi-core processors on one chip.

***“a plurality of data processing elements that each includes at least one arithmetic-logic unit (ALU) and a plurality of registers adapted for storing data”***

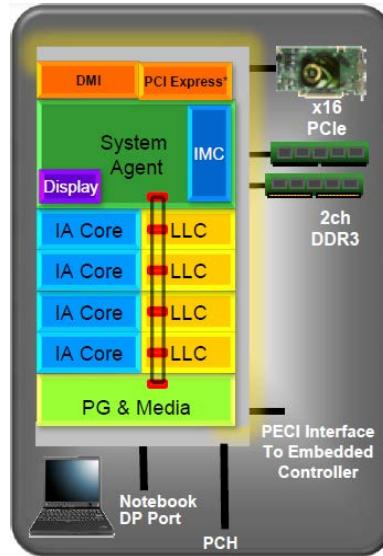
186. The Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities comprise a plurality of processing Cores. Each Core consists of at least one arithmetic-logic unit (ALU), as well as a plurality of general-purpose registers.

***“a plurality of memory elements that each independently operates as a cache for caching data; and”***

187. The Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities comprise multiple Last Level Caches (LLCs), each of which is capable of operating independently as a cache for caching data.

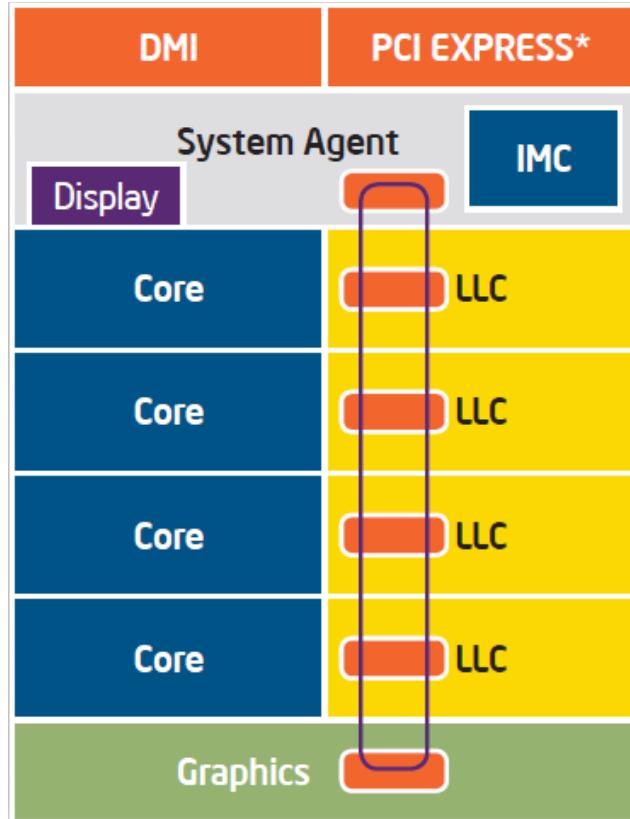
***“at least one interface element for providing a connection to a common higher level memory”***

188. The Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities comprise a System Agent, an interface providing a connection to a common higher-level external memory such as DDR3, as illustrated below.



*“wherein each of the data processing elements, each of the memory elements, and each of the at least one interface element are interconnected via a bus system for transferring data at least between (i) at least one of the data processing elements and at least one of the memory elements and (ii) at least one of the memory elements and the at least one interface element”*

189. The Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities include at least a ring bus system (or equivalents), a bus system used for communication between the Cores (the data processing elements), the LLC slices (the memory elements), and the System Agent (the interface element).



*“wherein the bus system is adapted for dynamically establishing and releasing transmission channels between a sending one of the elements and a receiving one of the elements; and”*

190. The ring bus interfaces with the Cores, the LLC slices, and the System Agent through its cache boxes. Each cache box implements the ring logic to dynamically establish and release connections between sender and receiver.

*“wherein the bus system is adapted for forming at least one ring via interconnection elements that include pipeline-registers”*

191. The ring bus system (or equivalents) forms a ring configuration as shown above, with each of its cache boxes acting as an interconnection element. Each cache box has a cache pipeline.

192. In violation of 35 U.S.C. § 271, Intel has infringed and is currently infringing, directly and/or through intermediaries, the '807 Patent by making, using, selling, offering for sale,

and/or importing into the United States, without authority, products that practice at least claim 1 of the '807 Patent. These products include the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities, and any other products that incorporate the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities. Intel has infringed and is currently infringing literally and/or under the doctrine of equivalents.

193. On information and belief, PACT asserts that Intel was aware of this patent before this lawsuit was filed, and at least as of the service of the Complaint in PACT XPP Schweiz AG v. Intel Corporation, 1-19-cv-00267 (DED), Intel had actual knowledge of its infringement of the '807 Patent.

194. PACT is informed and believes, and thereon alleges, that Intel, subsequent to the time it first learned of the '807 Patent and at least as of the time of service of the Complaint in PACT XPP Schweiz AG v. Intel Corporation, 1-19-cv-00267 (DED), specifically intended to induce patent infringement by third-party original equipment manufacturers (OEMs), customers, and users of the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities and had knowledge that the inducing acts would cause infringement or is willfully blind to the possibility that their inducing acts would cause infringement. Intel has sold and continues to sell the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities to OEMs making OEM products (*e.g.*, computers, servers, laptops, tablets, etc.), knowing that the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities will be included in the OEM products and sold to customers in the United States in violation of U.S. patent law, and/or to original design manufacturers (ODMs), knowing that the Accused Core

Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities will ultimately be included in OEM products and sold to customers in the United States.

195. Indeed, Intel's "Intel Inside" campaign has informed customers through advertising and stickers on the OEM products themselves that the products contain the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities. Intel also knows that many such OEM products that contain the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities are made outside the United States and are imported into the United States in violation of U.S. patent law. Intel also knows that U.S. customers of the OEMs use the OEM products containing the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities in the United States in violation of U.S. patent law.

196. Intel also publicly provides documentation, including datasheets available through Intel's publicly accessible ARK service and software developer's manuals, instructing customers on uses of Intel's products that infringe the '807 Patent. *See, e.g.,* <http://ark.intel.com>. In addition, Intel specifically advertises and promotes the infringing use of Intel's products, including the ring bus system and its equivalent. *See, e.g.,* <https://software.intel.com/en-us/articles/how-memory-is-accessed>.

197. On information and belief, Intel's customers directly infringe the '807 Patent by, for example, making, using, offering to sell, and selling within the United States, and importing into the United States, without authority or license, products containing the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities.

198. Intel contributes to the infringement of the '807 Patent in violation of 35 U.S.C. § 271(c). As stated above, on information and belief Intel was aware of the '807 Patent before this

lawsuit was filed but Intel was aware of the '807 Patent at least as of the time of service of the Complaint in PACT XPP Schweiz AG v. Intel Corporation, 1-19-cv-00267 (DED). Intel thus offers to sell and sells within the United States the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities knowing that those products constitute a material part of the claimed invention because Intel incorporates the accused components (ring bus system, multi-cores, LLCs, etc.) into the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities.

199. Intel knows that the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities are especially made or especially adapted for use in infringing the '807 Patent because the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities all contain the infringing components (ring bus system, multi-cores, LLCs, etc.). Furthermore, because the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities contain the infringing components (ring bus system, multi-cores, LLCs, etc.), they are not a staple article or commodity of commerce suitable for substantial non-infringing use.

200. In addition, Intel offers to sell and sells the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities to Original Equipment Manufacturers (OEMs) and/or Original Design Manufacturers (ODMs) who then incorporate the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities into infringing products which are used, sold, offered for sale, and/or imported in the United States in an infringing manner. Accordingly, Intel is liable as a contributory infringer.

201. In the alternative, to the extent Intel does not meet all of the limitations of the '807 Patent by making the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and

the Accused Celeron Instrumentalities in the United States, Intel infringes under 35 U.S.C. § 271(f)(1) and (f)(2) by supplying from the United States a substantial portion of the components of the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities (for example, structures or components contained in semiconductor wafers or dies or the like), and actively induces the combination of components outside the United States in a manner that would infringe the '807 Patent (for example, by packaging or assembly, or by incorporation into desktop computers, laptops, servers, tablets, or the like by ODMs or OEMs). Intel further supplies from the United States components which are especially made and especially adapted for use in practicing the '807 Patent, and not staple articles or a commodity of commerce suitable for substantial non-infringing use (for example, structures or components contained in semiconductor wafers or dies or the like). Intel knows the components are especially made and especially adapted to be combined outside of the United States in a manner that would infringe the '807 Patent (for example, by packaging or assembly, or by incorporation into desktop computers, laptops, servers, tablets, or the like by ODMs or OEMs). Based on these facts and the facts set forth in the paragraphs above, Intel infringes the '807 Patent under 35 U.S.C. § 271(f)(1) and (f)(2).

202. As a result of Intel's infringement of the '807 Patent, PACT has been damaged. PACT is entitled to recover for damages sustained as a result of Intel's wrongful acts in an amount subject to proof at trial but no less than a reasonable royalty.

203. In addition, Intel's infringing acts and practices have caused and are causing immediate and irreparable harm to PACT.

204. PACT is informed and believes, and thereon alleges, that the infringement of the '807 Patent by Intel has been and continues to be willful. As noted above, at least as of the

service of the Complaint in PACT XPP Schweiz AG v. Intel Corporation, 1-19-cv-00267 (DED), Intel has actual knowledge of its infringement of the '807 Patent. Intel has deliberately continued to infringe in a wanton, malicious, and egregious manner, with reckless disregard for PACT's patent rights. Thus, Intel's infringing actions have been and continue to be consciously wrongful, entitling PACT to increased damages under 35 U.S.C. § 284.

205. PACT is informed and believes, and thereon alleges, that this is an exceptional case, which warrants an award of attorney's fees to PACT pursuant to 35 U.S.C. § 285.

**COUNT VIII – INFRINGEMENT OF U.S. PATENT NO. 9,075,605**

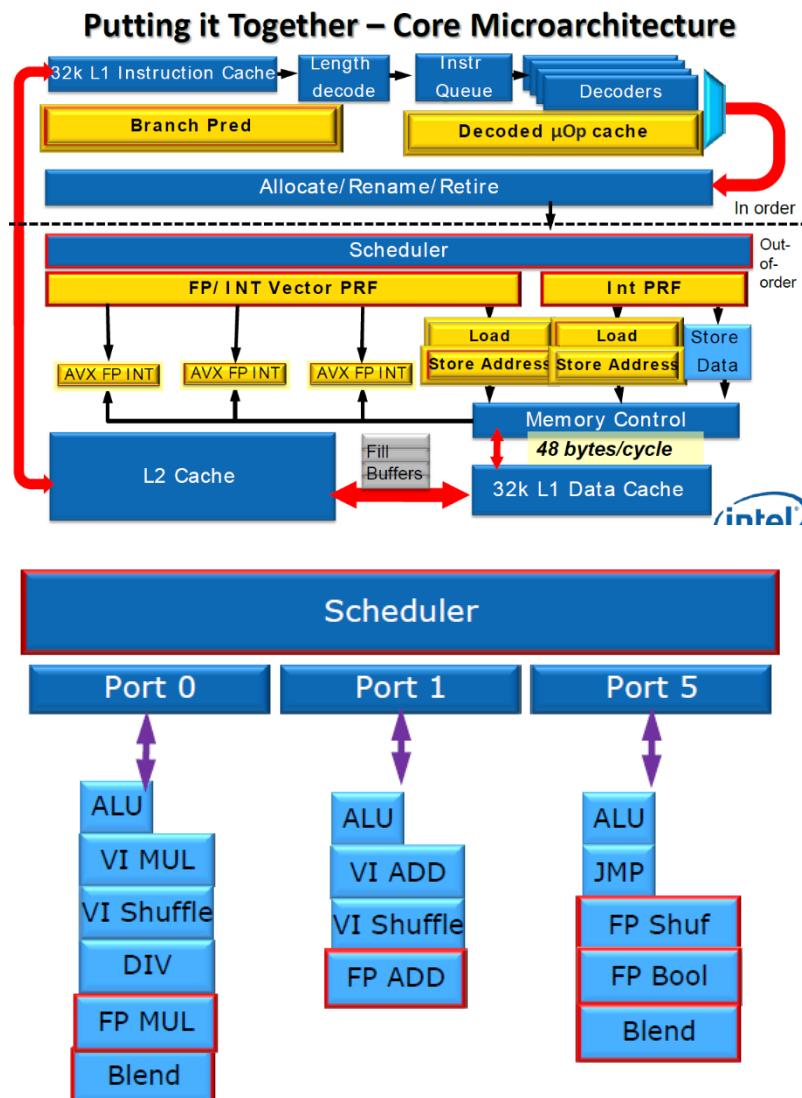
206. PACT incorporates each of the above paragraphs 1-35 as though fully set forth herein.

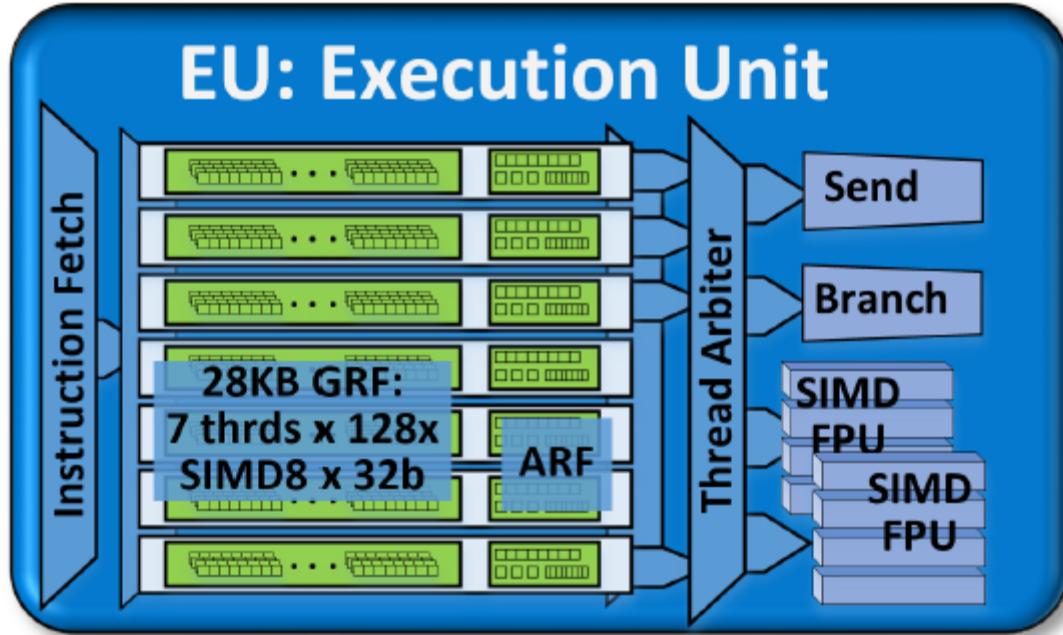
207. PACT is informed and believes, and thereon alleges, that Intel has infringed and unless enjoined will continue to infringe one or more claims of the '605 Patent, in violation of 35 U.S.C. § 271, by, among other things, making, using (including testing), offering to sell, and selling within the United States, supplying or causing to be supplied in or from the United States, and importing into the United States, without authority or license, Intel products with the infringing features, including the Accused Turbo Boost Instrumentalities.

208. For example, the Accused Turbo Boost Instrumentalities embody every limitation of at least claim 1 of the '605 Patent, literally or under the doctrine of equivalents, as set forth below. The further descriptions below, which are based on publicly available information, are preliminary examples and are non-limiting.

*"A method for operating a multiprocessor system comprising a plurality of data processing units, each of the plurality of data processing units (a) including at least one Arithmetic Logic Unit (ALU) and a register unit and (b) being adapted for sequentially processing data, the method comprising:"*

209. The Accused Turbo Boost Instrumentalities perform a method for operating a multiprocessor system comprising a plurality of data processing units, each of the plurality of data processing units (a) including at least one Arithmetic Logic Unit (ALU) and a register unit and (b) being adapted for sequentially processing data. The data processing units include core processors and graphics processors. Each of the core and graphics processors includes at least one ALU and a register as shown below:

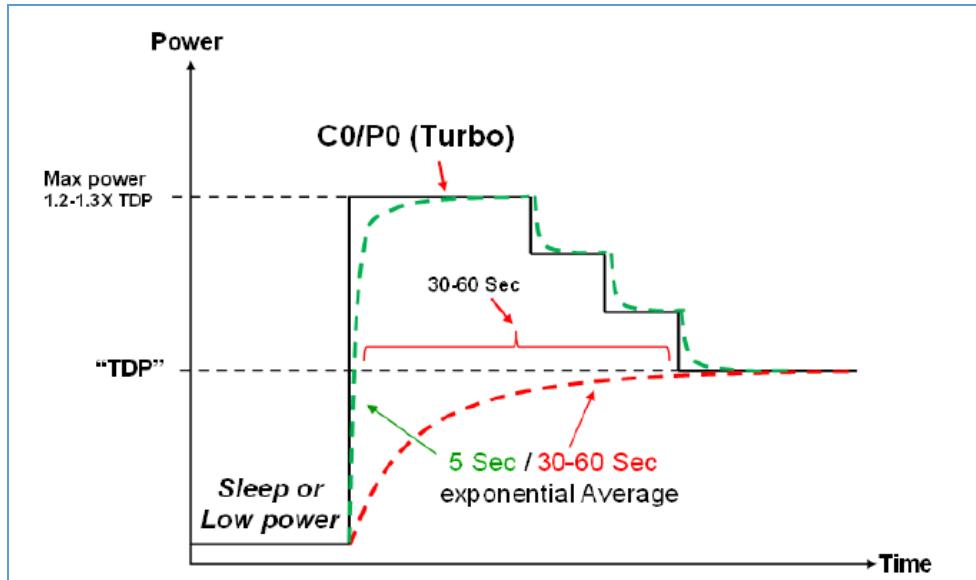




210. The core processors and graphics processors being adapted for sequentially processing data at least with regard to preparing and rendering graphics frames.

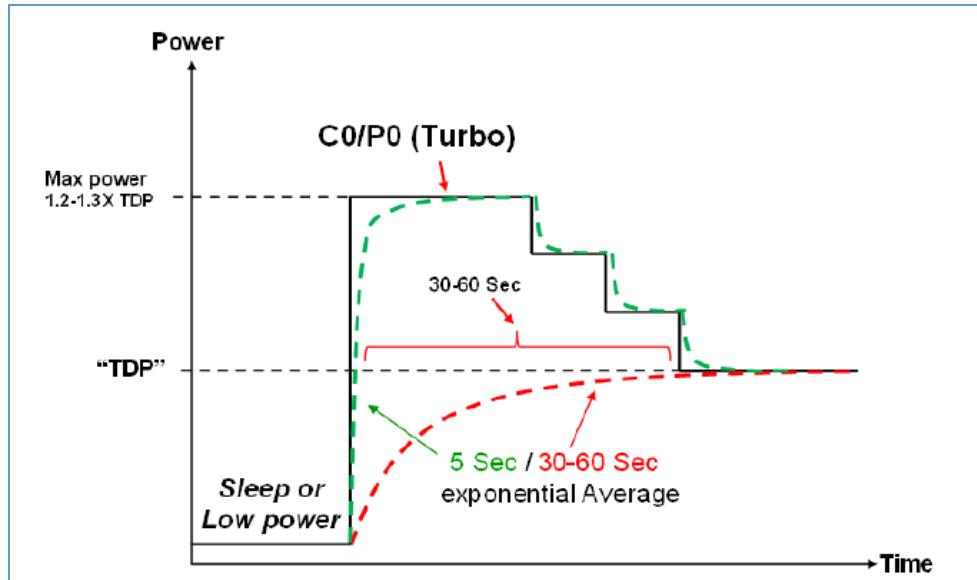
*“the multiprocessor system setting a clock frequency, of at least a part of the multiprocessor system to a minimum in accordance with a number of pending operations of a first processor;”*

211. The Accused Turbo Boost Instrumentalities set a clock frequency, of at least a part of the multiprocessor system to a minimum in accordance with a number of pending operations of a first processor. For example, the graphics processor(s)’s clock frequency is set to a minimum in accordance with a number of pending operations of core/graphics processor(s) through the Turbo Boost feature shown below:



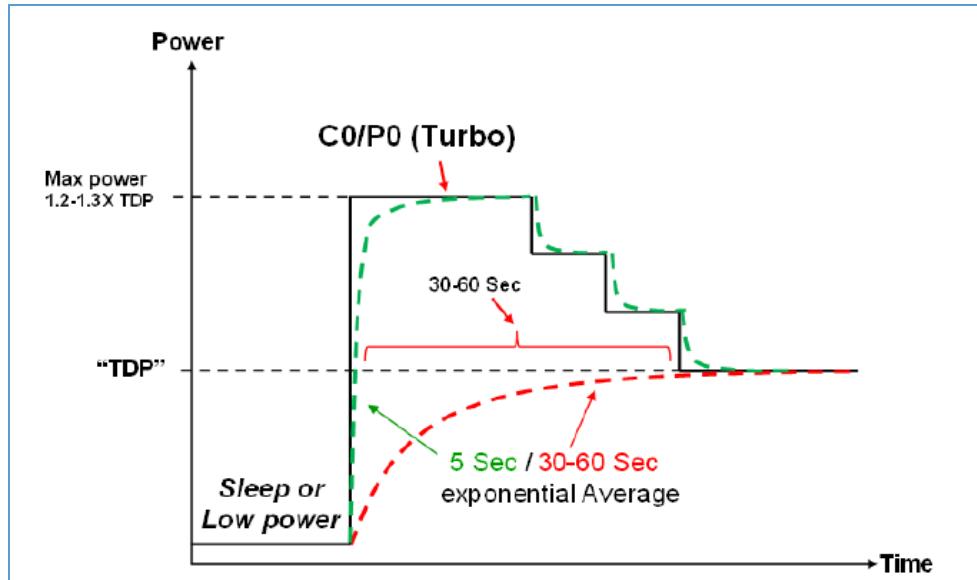
*“the multiprocessor system subsequently increasing the clock frequency of the at least the part of the multiprocessor system to a maximum in accordance with a number of pending operations of a second processor; and”*

212. The Accused Turbo Boost Instrumentalities subsequently increasing the clock frequency of the at least the part of the multiprocessor system to a maximum in accordance with a number of pending operations of a second processor. For example, the graphics processor(s)’s clock frequency is subsequently increased to a maximum in accordance with a number of pending operations of core/graphics processor(s) through the Turbo Boost feature shown below:



*“the multiprocessor system subsequently reducing the clock frequency of the at least the part of the multiprocessor system in accordance with (a) an operating temperature threshold preventing over-temperature and (b) a hysteresis characteristic.”*

213. The Accused Turbo Boost Instrumentalities subsequently reduce the clock frequency of the at least the part of the multiprocessor system in accordance with (a) an operating temperature threshold preventing over-temperature and (b) a hysteresis characteristic. For example, the graphics processor(s)’s clock frequency is subsequently reduced in accordance with (a) an operating temperature threshold preventing over-temperature and (b) a hysteresis characteristic, both of which are indicated below:



214. In violation of 35 U.S.C. § 271, Intel has infringed and is currently infringing, directly and/or through intermediaries, the '605 Patent by making, using, selling, offering for sale, and/or importing into the United States, without authority, products that practice at least claim 1 of the '605 Patent. These products include the Accused Turbo Boost Instrumentalities, and any other products that incorporate the Accused Turbo Boost Instrumentalities. Intel has infringed and is currently infringing literally and/or under the doctrine of equivalents.

215. To the extent the method claims of the '605 Patent are also performed by Intel's customers, end users and/or other intermediaries, Intel infringes because the customers, the end users, and/or the intermediaries using the products Intel manufactures can only use said products if using programming steps provided by Intel and under the terms prescribed by Intel, because Intel through its programming and manufactures controls the method whereby users are able to use the infringing processors, and because Intel conditions receipt of the benefit of the accused feature upon performance of the steps of the patented method(s) and establishes the manner and/or timing of that performance, and Intel is thus liable under Section 271(a).

216. On information and belief, PACT asserts that Intel was aware of this patent before this lawsuit was filed, and at least as of the service of the Complaint in PACT XPP Schweiz AG v. Intel Corporation, 1-19-cv-00267 (DED), Intel had actual knowledge of its infringement of the '605 Patent.

217. PACT is informed and believes, and thereon alleges, that Intel, subsequent to the time it first learned of the '605 Patent and at least as of the time of service of the Complaint in PACT XPP Schweiz AG v. Intel Corporation, 1-19-cv-00267 (DED), specifically intended to induce patent infringement by third-party original equipment manufacturers (OEMs), customers, and users of the Accused Turbo Boost Instrumentalities and had knowledge that the inducing acts would cause infringement or is willfully blind to the possibility that their inducing acts would cause infringement. Intel has sold and continues to sell the Accused Turbo Boost Instrumentalities to OEMs making OEM products (computers, laptops, tablets, etc.), knowing that the Accused Turbo Boost Instrumentalities will be included in the OEM products and sold to customers in the United States in violation of U.S. patent law, and/or to original design manufacturers (ODMs), knowing that the Accused Turbo Boost Instrumentalities will ultimately be included in OEM products and sold to customers in the United States.

218. Indeed, Intel's "Intel Inside" campaign has informed customers through advertising and stickers on the OEM products themselves that the products contain the Accused Turbo Boost Instrumentalities. Intel also knows that many such OEM products that contain the Accused Turbo Boost Instrumentalities are made outside the United States and are imported into the United States in violation of U.S. patent law. Intel also knows that U.S. customers of the OEMs use the OEM products containing the Accused Turbo Boost Instrumentalities in the United States in violation of U.S. patent law.

219. Intel also publicly provides documentation, including datasheets available through Intel's publicly accessible ARK service and software developer's manuals, instructing customers on uses of Intel's products that infringe the '605 Patent. *See, e.g.*, <http://ark.intel.com>. In addition, Intel specifically advertises and promotes the infringing use of Intel's products, including Turbo Boost. *See, e.g.*, <https://www.intel.com/content/www/us/en/architecture-and-technology/turbo-boost/turbo-boost-technology.html> and <https://www.intel.com/content/www/us/en/architecture-and-technology/turbo-boost/turbo-boost-max-technology.html>.

220. On information and belief, Intel's customers directly infringe the '605 Patent by, for example, making, using, offering to sell, and selling within the United States, and importing into the United States, without authority or license, products containing the Accused Core Instrumentalities.

221. Intel contributes to the infringement of the '605 Patent in violation of 35 U.S.C. § 271(c). As stated above, on information and belief Intel was aware of the '605 Patent before this lawsuit was filed but Intel was aware of the '605 Patent at least as of the time of service of the Complaint in PACT XPP Schweiz AG v. Intel Corporation, 1-19-cv-00267 (DED). Intel thus offers to sell and sells within the United States the Accused Turbo Boost Instrumentalities knowing that those products constitute a material part of the claimed invention because Intel incorporates the accused components (core/graphics processors with Turbo Boost feature, etc.) into the Accused Turbo Boost Instrumentalities.

222. Intel knows that the Accused Turbo Boost Instrumentalities are especially made or especially adapted for use in infringing the '605 Patent because the Accused Turbo Boost Instrumentalities all contain the infringing components (core/graphics processors with Turbo Boost feature, etc.). Furthermore, because the Accused Turbo Boost Instrumentalities contain the

infringing components (core/graphics processors with Turbo Boost feature, etc.), they are not a staple article or commodity of commerce suitable for substantial non-infringing use.

223. In addition, Intel offers to sell and sells the Accused Turbo Boost Instrumentalities to Original Equipment Manufacturers (OEMs) and/or Original Design Manufacturers (ODMs) who then incorporate the Accused Turbo Boost Instrumentalities into infringing products which are used, sold, offered for sale, and/or imported in the United States in an infringing manner. Accordingly, Intel is liable as a contributory infringer.

224. As a result of Intel's infringement of the '605 Patent, PACT has been damaged. PACT is entitled to recover for damages sustained as a result of Intel's wrongful acts in an amount subject to proof at trial but no less than a reasonable royalty.

225. In addition, Intel's infringing acts and practices have caused and are causing immediate and irreparable harm to PACT.

226. PACT is informed and believes, and thereon alleges, that the infringement of the '605 Patent by Intel has been and continues to be willful. As noted above, at least as of the service of the Complaint in PACT XPP Schweiz AG v. Intel Corporation, 1-19-cv-00267 (DED), Intel has actual knowledge of its infringement of the '605 Patent. Intel has deliberately continued to infringe in a wanton, malicious, and egregious manner, with reckless disregard for PACT's patent rights. Thus, Intel's infringing actions have been and continue to be consciously wrongful, entitling PACT to increased damages under 35 U.S.C. § 284.

227. PACT is informed and believes, and thereon alleges, that this is an exceptional case, which warrants an award of attorney's fees to PACT pursuant to 35 U.S.C. § 285.

#### **COUNT IX – INFRINGEMENT OF U.S. PATENT NO. 9,170,812**

228. PACT incorporates each of the above paragraphs 1-35 as though fully set forth herein.

229. PACT is informed and believes, and thereon alleges, that Intel has infringed and unless enjoined will continue to infringe one or more claims of the '812 Patent, in violation of 35 U.S.C. § 271, by, among other things, making, using (including testing), offering to sell, and selling within the United States, supplying or causing to be supplied in or from the United States, and importing into the United States, without authority or license, Intel products with the infringing features, including the Accused Core Instrumentalities, the Accused Xeon Instrumentalities with graphics card, and the Accused Celeron Instrumentalities with graphics card.

230. For example, the Accused Core Instrumentalities, the Accused Xeon Instrumentalities with graphics card, and the Accused Celeron Instrumentalities with graphics card embody every limitation of at least claim 12 of the '812 Patent, literally or under the doctrine of equivalents, as set forth below. The further descriptions below, which are based on publicly available information, are preliminary examples and are non-limiting.

***“An integrated circuit data processor device comprising”***

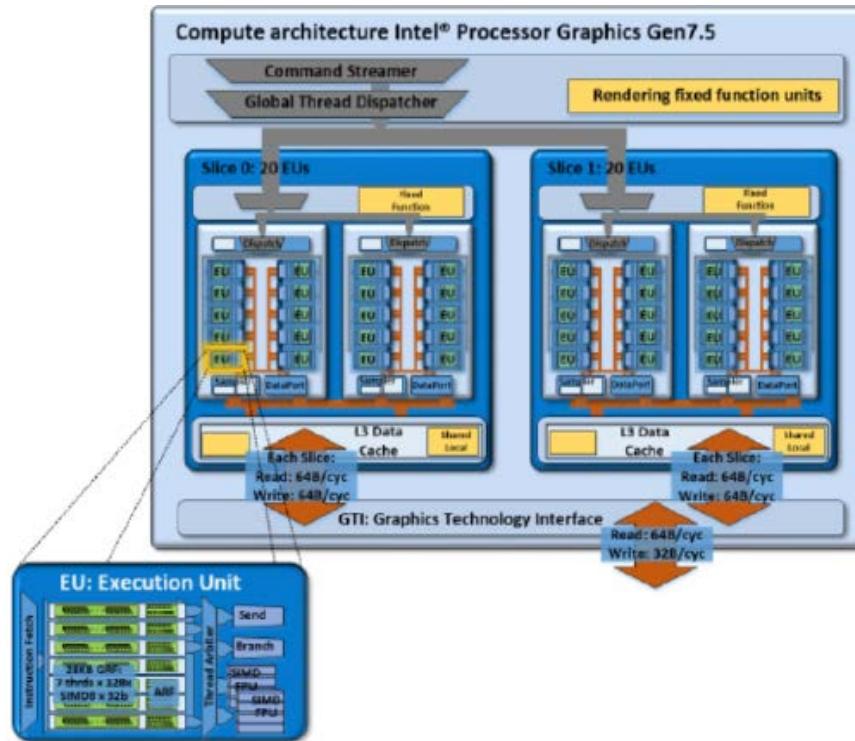
231. The Accused Core Instrumentalities, the Accused Xeon Instrumentalities with graphics card, and the Accused Celeron Instrumentalities with graphics card constitute an integrated circuit data processor device because they include multi-core data processors on a chip.

***“a data processor core having a plurality of data load units”***

232. The Accused Core Instrumentalities, the Accused Xeon Instrumentalities with graphics card, and the Accused Celeron Instrumentalities with graphics card include multiple data processor cores having load/store address units that constitute a plurality of data load units.

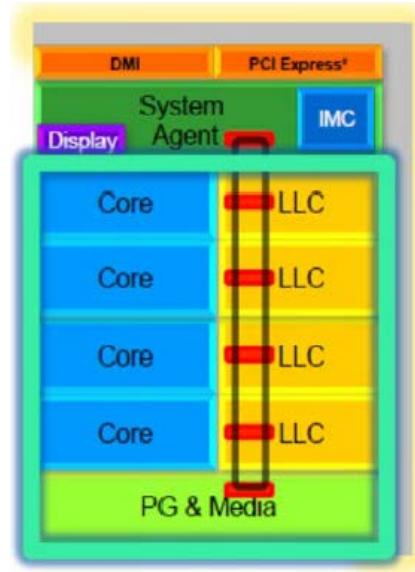
***“at least one array data processor having an array of parallel processing arithmetic execution units; and”***

233. The Accused Core Instrumentalities, the Accused Xeon Instrumentalities with graphics card, and the Accused Celeron Instrumentalities with graphics card include a graphics processor with execution units including ALUs shown in the figure below, hence, include one array data processor having an array of parallel processing arithmetic execution units.



*“a multi-level cache for caching instructions and data, at least one level of the multi-level cache comprising a plurality of cache slices, the multi-level cache being shared by the data processor core and the array data processor”*

234. The Accused Core Instrumentalities, the Accused Xeon Instrumentalities with graphics card, and the Accused Celeron Instrumentalities with graphics card include L1 cache, L2 cache, and multiple Last Level Caches caching instructions and data connecting to core and graphics processors and shared by the core and graphics processors as shown in the figure below:



*“an instruction dispatch unit separate from the data processor core connected to the array data processor, the instruction dispatch unit configured to dispatch software threads to the array data processor for parallel execution by the parallel processing arithmetic units”*

235. The Accused Core Instrumentalities, the Accused Xeon Instrumentalities with graphics card, and the Accused Celeron Instrumentalities with graphics card include a media pipeline on the graphics processor separate from the cores. The media pipeline is configured to dispatch software threads to the execution units including ALUs for parallel execution.

236. In violation of 35 U.S.C. § 271, Intel has infringed and is currently infringing, directly and/or through intermediaries, the '812 Patent by making, using, selling, offering for sale, and/or importing into the United States, without authority, products that practice at least claim 12 of the '812 Patent. These products include the Accused Core Instrumentalities, the Accused Xeon Instrumentalities with graphics card, and the Accused Celeron Instrumentalities with graphics card, and any other products that incorporate the Accused Core Instrumentalities, the Accused Xeon Instrumentalities with graphics card, and the Accused Celeron Instrumentalities with graphics card. Intel has infringed and is currently infringing literally and/or under the doctrine of equivalents.

237. On information and belief, PACT asserts that Intel was aware of this patent before this lawsuit was filed, and at least as of the service of the Complaint in PACT XPP Schweiz AG v. Intel Corporation, 1-19-cv-00267 (DED), Intel had actual knowledge of its infringement of the '812 Patent.

238. PACT is informed and believes, and thereon alleges, that Intel, subsequent to the time it first learned of the '812 Patent and at least as of the time of service of the Complaint in PACT XPP Schweiz AG v. Intel Corporation, 1-19-cv-00267 (DED), specifically intended to induce patent infringement by third-party original equipment manufacturers (OEMs), customers, and users of the Accused Core Instrumentalities, the Accused Xeon Instrumentalities with graphics card, and the Accused Celeron Instrumentalities with graphics card and had knowledge that the inducing acts would cause infringement or is willfully blind to the possibility that their inducing acts would cause infringement. Intel has sold and continues to sell the Accused Core Instrumentalities, the Accused Xeon Instrumentalities with graphics card, and the Accused Celeron Instrumentalities with graphics card to OEMs making OEM products (*e.g.*, computers, laptops, tablets, etc.), knowing that the Accused Core Instrumentalities will be included in the OEM products and sold to customers in the United States in violation of U.S. patent law, and/or to original design manufacturers (ODMs), knowing that the Accused Core Instrumentalities, the Accused Xeon Instrumentalities with graphics card, and the Accused Celeron Instrumentalities with graphics card will ultimately be included in OEM products and sold to customers in the United States.

239. Indeed, Intel's "Intel Inside" campaign has informed customers through advertising and stickers on the OEM products themselves that the products contain the Accused Core Instrumentalities, the Accused Xeon Instrumentalities with graphics card, and the Accused Celeron

Instrumentalities with graphics card. Intel also knows that many such OEM products that contain the Accused Core Instrumentalities, the Accused Xeon Instrumentalities with graphics card, and the Accused Celeron Instrumentalities with graphics card are made outside the United States and are imported into the United States in violation of U.S. patent law. Intel also knows that U.S. customers of the OEMs use the OEM products containing the Accused Core Instrumentalities, the Accused Xeon Instrumentalities with graphics card, and the Accused Celeron Instrumentalities with graphics card in the United States in violation of U.S. patent law.

240. Intel also publicly provides documentation, including datasheets available through Intel's publicly accessible ARK service and software developer's manuals, instructing customers on uses of Intel's products that infringe the '812 Patent. *See, e.g.,* <http://ark.intel.com>. In addition, Intel specifically advertises and promotes the infringing use of Intel's products, including relevant GPU features. *See, e.g.,* [https://simplecore.intel.com/nervana/wp-content/uploads/sites/53/2018/05/IntelAIDC18\\_MoniqueJones\\_YiGe\\_Odyssey\\_5\\_24\\_final.pdf](https://simplecore.intel.com/nervana/wp-content/uploads/sites/53/2018/05/IntelAIDC18_MoniqueJones_YiGe_Odyssey_5_24_final.pdf).

241. On information and belief, Intel's customers directly infringe the '812 Patent by, for example, making, using, offering to sell, and selling within the United States, and importing into the United States, without authority or license, products containing the Accused Core Instrumentalities, the Accused Xeon Instrumentalities with graphics card, and the Accused Celeron Instrumentalities with graphics card.

242. Intel contributes to the infringement of the '812 Patent in violation of 35 U.S.C. § 271(c). As stated above, on information and belief Intel was aware of the '812 Patent before this lawsuit was filed but Intel was aware of the '812 Patent at least as of the time of service of the Complaint in PACT XPP Schweiz AG v. Intel Corporation, 1-19-cv-00267 (DED). Intel thus offers to sell and sells within the United States the Accused Core Instrumentalities, the Accused

Xeon Instrumentalities with graphics card, and the Accused Celeron Instrumentalities with graphics card knowing that those products constitute a material part of the claimed invention because Intel incorporates the accused components (ring bus system, multi-cores, LLCs, and GPU, etc.) into the Accused Core Instrumentalities, the Accused Xeon Instrumentalities with graphics card, and the Accused Celeron Instrumentalities with graphics card.

243. Intel knows that the Accused Core Instrumentalities, the Accused Xeon Instrumentalities with graphics card, and the Accused Celeron Instrumentalities with graphics card are especially made or especially adapted for use in infringing the '812 Patent because the Accused Core Instrumentalities, the Accused Xeon Instrumentalities with graphics card, and the Accused Celeron Instrumentalities with graphics card all contain the infringing components (ring bus system, multi-cores, LLCs, and GPU, etc.). Furthermore, because the Accused Core Instrumentalities, the Accused Xeon Instrumentalities with graphics card, and the Accused Celeron Instrumentalities with graphics card contain the infringing components (ring bus system, multi-cores, LLCs, and GPU, etc.), they are not a staple article or commodity of commerce suitable for substantial non-infringing use.

244. In addition, Intel offers to sell and sells the Accused Core Instrumentalities, the Accused Xeon Instrumentalities with graphics card, and the Accused Celeron Instrumentalities with graphics card to Original Equipment Manufacturers (OEMs) and/or Original Design Manufacturers (ODMs) who then incorporate the Accused Core Instrumentalities, the Accused Xeon Instrumentalities with graphics card, and the Accused Celeron Instrumentalities with graphics card into infringing products which are used, sold, offered for sale, and/or imported in the United States in an infringing manner. Accordingly, Intel is liable as a contributory infringer.

245. In the alternative, to the extent Intel does not meet all of the limitations of the '812 Patent by making the Accused Core Instrumentalities, the Accused Xeon Instrumentalities with graphics card, and the Accused Celeron Instrumentalities with graphics card in the United States, Intel infringes under 35 U.S.C. § 271(f)(1) and (f)(2) by supplying from the United States a substantial portion of the components of the Accused Core Instrumentalities, the Accused Xeon Instrumentalities with graphics card, and the Accused Celeron Instrumentalities with graphics card (for example, structures or components contained in semiconductor wafers or dies or the like), and actively induces the combination of components outside the United States in a manner that would infringe the '812 Patent (for example, by packaging or assembly, or by incorporation into desktop computers, laptops, tablets, or the like by ODMs or OEMs). Intel further supplies from the United States components which are especially made and especially adapted for use in practicing the '812 Patent, and not staple articles or a commodity of commerce suitable for substantial non-infringing use (for example, structures or components contained in semiconductor wafers or dies or the like). Intel knows the components are especially made and especially adapted to be combined outside of the United States in a manner that would infringe the '812 Patent (for example, by packaging or assembly, or by incorporation into desktop computers, laptops, tablets, or the like by ODMs or OEMs). Based on these facts and the facts set forth in the paragraphs above, Intel infringes the '812 Patent under 35 U.S.C. § 271(f)(1) and (f)(2).

246. As a result of Intel's infringement of the '812 Patent, PACT has been damaged. PACT is entitled to recover for damages sustained as a result of Intel's wrongful acts in an amount subject to proof at trial but no less than a reasonable royalty.

247. In addition, Intel's infringing acts and practices have caused and are causing immediate and irreparable harm to PACT.

248. PACT is informed and believes, and thereon alleges, that the infringement of the '812 Patent by Intel has been and continues to be willful. As noted above, at least as of the service of the Complaint in PACT XPP Schweiz AG v. Intel Corporation, 1-19-cv-00267 (DED), Intel has actual knowledge of its infringement of the '812 Patent. Intel has deliberately continued to infringe in a wanton, malicious, and egregious manner, with reckless disregard for PACT's patent rights. Thus, Intel's infringing actions have been and continue to be consciously wrongful, entitling PACT to increased damages under 35 U.S.C. § 284.

249. PACT is informed and believes, and thereon alleges, that this is an exceptional case, which warrants an award of attorney's fees to PACT pursuant to 35 U.S.C. § 285.

**COUNT X – INFRINGEMENT OF U.S. PATENT NO. 9,250,908**

250. PACT incorporates each of the above paragraphs 1-35 as though fully set forth herein.

251. PACT is informed and believes, and thereon alleges, that Intel has infringed and unless enjoined will continue to infringe one or more claims of the '908 Patent, in violation of 35 U.S.C. § 271, by, among other things, making, using (including testing), offering to sell, and selling within the United States, supplying or causing to be supplied in or from the United States, and importing into the United States, without authority or license, Intel products with the infringing features, including the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities.

252. For example, the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities embody every limitation of at least claim 4 of the '908 Patent, literally or under the doctrine of equivalents, as set forth below. The further descriptions below, which are based on publicly available information, are preliminary examples and are non-limiting.

***“A system, the system comprising:”***

253. The Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities are a system.

***“a processing system comprising a plurality of processors and”***

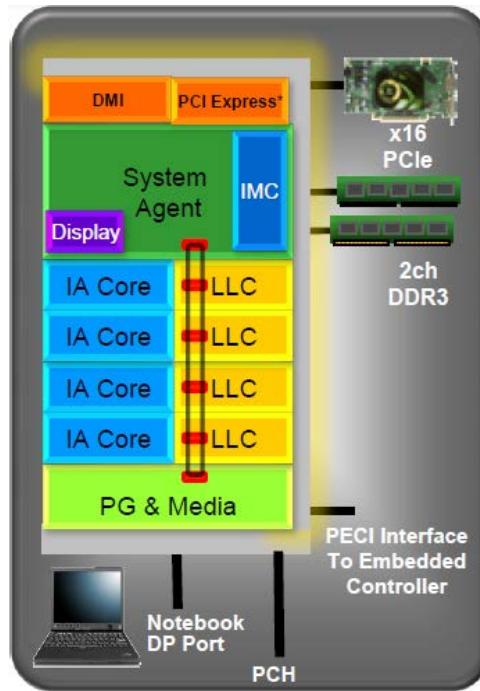
254. The Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities are processing systems with more than one processor core.

***“at least one separated cache not part any processor”***

255. The Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities comprise an area of Last Level Caches (LLCs), which is distinctly set apart from the Cores.

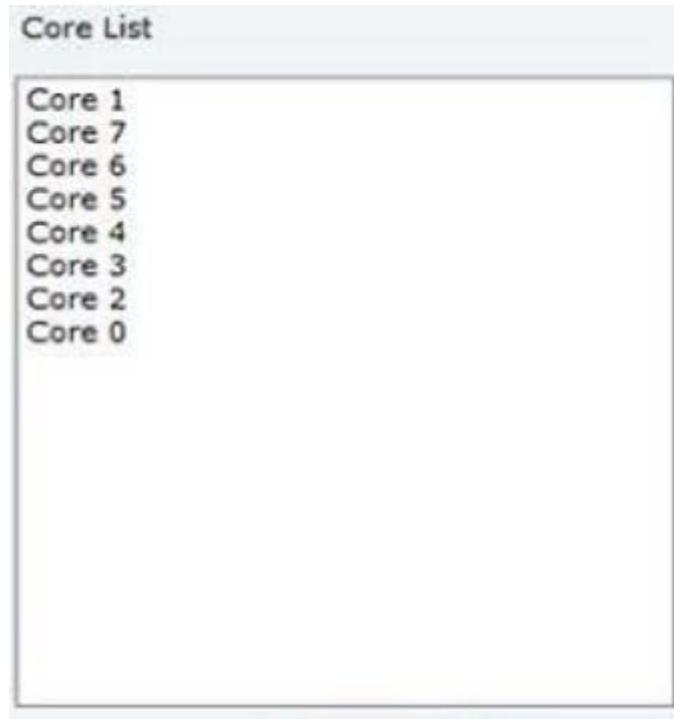
***“a bus system connecting the processing system to one or more external devices; at least one interface transmitting data between the processing system and external devices via the bus system”***

256. The Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities include at least one ring bus system (or equivalents), a bus system used for communication between the Cores (the processing system), the LLC slices, and the System Agent (interface). The System Agent interface enables the bus system to connect to at least one external device via the bus system shown in the figure below.



*“at least some of the plurality of processors, the at least one interface, and the at least one separated cache having a module identification (ID); and wherein”*

257. On information and belief, at least some of the processor Cores, the System Agent, and at least one LLC are associated with identifications.

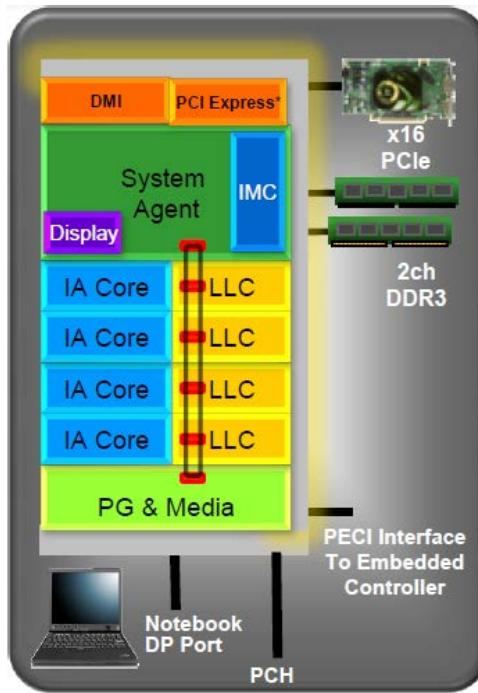


*“the at least one interface to transmit data via the bus system using a protocol, comprising: i. the module ID of an interface, a processor, a separated cache requesting a transmission, ii. the module ID of an interface, a processor, a separated cache receiving a transmission; and/or iii. the address of a target within the interface, the processor, the separated cache or the external device unit receiving a transmission; and”*

258. The above identified interface transmits data via the ring bus system (or equivalents) using a protocol that includes the ID and/or the address of the sender (Core, LLC, or System Agent) and/or the receiver (Core, LLC, System Agent, or external device), and/or the target within the sender or the receiver.

*“wherein the at least one separated cache comprises a separated cache segment for at least some of the plurality of processors”*

259. Each LLC slice in the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities is a separate cache segment, each available to interconnect with a plurality of processing Cores shown below:



*“the system further comprising: an interconnect system interconnecting each of the separated cache segments with each of the processors, each of the processors with neighboring processors, and each of the separated cache segments with neighboring separated cache segments”*

260. The Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities include at least one ring bus system (or equivalents) interconnecting between the Cores, the LLCs, and their respective neighbors as shown in the figure above.

*“an arbiter, the arbiter controlling access of a processor to the interconnect system”*

261. The ring bus system (or equivalents) interfaces with the Cores through its cache boxes. Each cache box implements the arbitration and therefore acts as an arbiter for controlling access to the ring bus system (or equivalents) by the core.

262. In violation of 35 U.S.C. § 271, Intel has infringed and is currently infringing, directly and/or through intermediaries, the '908 Patent by making, using, selling, offering for sale, and/or importing into the United States, without authority, products that practice at least claim 4 of the '908 Patent. These products include the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities, and any other products that incorporate the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities. Intel has infringed and is currently infringing literally and/or under the doctrine of equivalents.

263. On information and belief, PACT asserts that Intel was aware of this patent before this lawsuit was filed, and at least as of the service of the Complaint in PACT XPP Schweiz AG v. Intel Corporation, 1-19-cv-00267 (DED), Intel had actual knowledge of its infringement of the '908 Patent.

264. PACT is informed and believes, and thereon alleges, that Intel, subsequent to the time it first learned of the '908 Patent and at least as of the time of service of the Complaint in PACT XPP Schweiz AG v. Intel Corporation, 1-19-cv-00267 (DED), specifically intended to induce patent infringement by third-party original equipment manufacturers (OEMs), customers, and users of the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities and had knowledge that the inducing acts would cause infringement or is willfully blind to the possibility that their inducing acts would cause infringement. Intel has sold and continues to sell the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities to OEMs making OEM products (*e.g.*, computers, servers, laptops, tablets, etc.), knowing that the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities

will be included in the OEM products and sold to customers in the United States in violation of U.S. patent law, and/or to original design manufacturers (ODMs), knowing that the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities will ultimately be included in OEM products and sold to customers in the United States.

265. Indeed, Intel's "Intel Inside" campaign has informed customers through advertising and stickers on the OEM products themselves that the products contain the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities. Intel also knows that many such OEM products that contain the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities are made outside the United States and are imported into the United States in violation of U.S. patent law. Intel also knows that U.S. customers of the OEMs use the OEM products containing the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities in the United States in violation of U.S. patent law.

266. Intel also publicly provides documentation, including datasheets available through Intel's publicly accessible ARK service and software developer's manuals, instructing customers on uses of Intel's products that infringe the '908 Patent. *See, e.g.,* <http://ark.intel.com>. In addition, Intel specifically advertises and promotes the infringing use of Intel's products, including the ring bus system and its equivalent. *See, e.g.,* <https://software.intel.com/en-us/articles/how-memory-is-accessed>.

267. On information and belief, Intel's customers directly infringe the '908 Patent by, for example, making, using, offering to sell, and selling within the United States, and importing into the United States, without authority or license, products containing the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities.

268. Intel contributes to the infringement of the '908 Patent in violation of 35 U.S.C. § 271(c). As stated above, on information and belief Intel was aware of the '908 Patent before this lawsuit was filed but Intel was aware of the '908 Patent at least as of the time of service of the Complaint in PACT XPP Schweiz AG v. Intel Corporation, 1-19-cv-00267 (DED). Intel thus offers to sell and sells within the United States the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities knowing that those products constitute a material part of the claimed invention because Intel incorporates the accused components (ring bus system, multi-cores, LLCs, etc.) into the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities.

269. Intel knows that the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities are especially made or especially adapted for use in infringing the '908 Patent because the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities all contain the infringing components (ring bus system, multi-cores, LLCs, etc.). Furthermore, because the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities contain the infringing components (ring bus system, multi-cores, LLCs, etc.), they are not a staple article or commodity of commerce suitable for substantial non-infringing use.

270. In addition, Intel offers to sell and sells the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities to Original Equipment Manufacturers (OEMs) and/or Original Design Manufacturers (ODMs) who then incorporate the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities into infringing products which are used, sold, offered for sale, and/or imported in the United States in an infringing manner. Accordingly, Intel is liable as a contributory infringer.

271. In the alternative, to the extent Intel does not meet all of the limitations of the '908 Patent by making the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities in the United States, Intel infringes under 35 U.S.C. § 271(f)(1) and (f)(2) by supplying from the United States a substantial portion of the components of the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities (for example, structures or components contained in semiconductor wafers or dies or the like), and actively induces the combination of components outside the United States in a manner that would infringe the '908 Patent (for example, by packaging or assembly, or by incorporation into desktop computers, laptops, servers, tablets, or the like by ODMs or OEMs). Intel further supplies from the United States components which are especially made and especially adapted for use in practicing the '908 Patent, and not staple articles or a commodity of commerce suitable for substantial non-infringing use (for example, structures or components contained in semiconductor wafers or dies or the like). Intel knows the components are especially made and especially adapted to be combined outside of the United States in a manner that would infringe the '908 Patent (for example, by packaging or assembly, or by incorporation into desktop computers, laptops, servers, tablets, or the like by ODMs or OEMs). Based on these facts and the facts set forth in the paragraphs above, Intel infringes the '908 Patent under 35 U.S.C. § 271(f)(1) and (f)(2).

272. As a result of Intel's infringement of the '908 Patent, PACT has been damaged. PACT is entitled to recover for damages sustained as a result of Intel's wrongful acts in an amount subject to proof at trial but no less than a reasonable royalty.

273. In addition, Intel's infringing acts and practices have caused and are causing immediate and irreparable harm to PACT.

274. PACT is informed and believes, and thereon alleges, that the infringement of the '908 Patent by Intel has been and continues to be willful. As noted above, at least as of the service of the Complaint in PACT XPP Schweiz AG v. Intel Corporation, 1-19-cv-00267 (DED), Intel has actual knowledge of its infringement of the '908 Patent. Intel has deliberately continued to infringe in a wanton, malicious, and egregious manner, with reckless disregard for PACT's patent rights. Thus, Intel's infringing actions have been and continue to be consciously wrongful, entitling PACT to increased damages under 35 U.S.C. § 284.

275. PACT is informed and believes, and thereon alleges, that this is an exceptional case, which warrants an award of attorney's fees to PACT pursuant to 35 U.S.C. § 285.

**COUNT XI – INFRINGEMENT OF U.S. PATENT NO. 9,436,631**

276. PACT incorporates each of the above paragraphs 1-35 as though fully set forth herein.

277. PACT is informed and believes, and thereon alleges, that Intel has infringed and unless enjoined will continue to infringe one or more claims of the '631 Patent, in violation of 35 U.S.C. § 271, by, among other things, making, using (including testing), offering to sell, and selling within the United States, supplying or causing to be supplied in or from the United States, and importing into the United States, without authority or license, Intel products with the infringing features, including the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities.

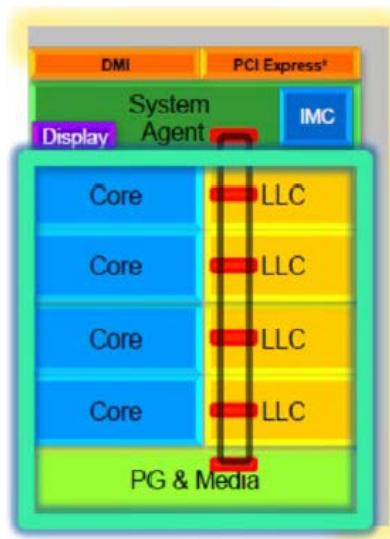
278. For example, the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities embody every limitation of at least claim 1 of the '631 Patent, literally or under the doctrine of equivalents, as set forth below. The further descriptions below, which are based on publicly available information, are preliminary examples and are non-limiting.

***“A bus system for transferring data between parts of a multiprocessor system, the bus system comprising”***

279. The Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities include at least a ring bus system (or equivalents) used for transferring data between parts of a multiprocessor system such as the cores, the Last Level Caches (LLCs), and the System Agent.

***“a plurality of bus segments for each processor of the multiprocessor system comprising a plurality of flexible data channels to each processor of the multiprocessor system according to algorithms to be executed, wherein a plurality of algorithms may be executed in parallel”***

280. The ring bus system (or equivalents) interfaces with the Cores, the LLC slices, and the System Agent in the way shown in the figure below. As such, it is segmented and includes flexible data channels available to each core according to algorithms fed to the cores. These algorithms may be executed in parallel by multiple cores.



***“wherein a communication between a sender and a receiver is established in accordance with a data transfer for an executed algorithm; and”***

281. The connection between a Core and an LLC slice depends on the data transfer requirement(s) of the algorithm executed on the Core.

*“at least one identifier is transmitted with the data for at least one of: identifying a source of the data transfer; and selecting a target of the data transfer.”*

282. On information and belief, the Cores, the System Agent, and/or LLC slices associate with an identifier as to the requester and/or an identifier as to the destination of a data transmission, and such identifier is transmitted with the data and used to identify source and/or target of the data.

283. In violation of 35 U.S.C. § 271, Intel has infringed and is currently infringing, directly and/or through intermediaries, the '631 Patent by making, using, selling, offering for sale, and/or importing into the United States, without authority, products that practice at least claim 1 of the '631 Patent. These products include the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities, and any other products that incorporate the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities. Intel has infringed and is currently infringing literally and/or under the doctrine of equivalents.

284. On information and belief, PACT asserts that Intel was aware of this patent before this lawsuit was filed, and at least as of the service of the Complaint in PACT XPP Schweiz AG v. Intel Corporation, 1-19-cv-00267 (DED), Intel had actual knowledge of its infringement of the '631 Patent.

285. PACT is informed and believes, and thereon alleges, that Intel, subsequent to the time it first learned of the '631 Patent and at least as of the time of service of the Complaint in PACT XPP Schweiz AG v. Intel Corporation, 1-19-cv-00267 (DED), specifically intended to

induce patent infringement by third-party original equipment manufacturers (OEMs), customers, and users of the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities and had knowledge that the inducing acts would cause infringement or is willfully blind to the possibility that their inducing acts would cause infringement. Intel has sold and continues to sell the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities to OEMs making OEM products (*e.g.*, computers, servers, laptops, tablets, etc.), knowing that the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities will be included in the OEM products and sold to customers in the United States in violation of U.S. patent law, and/or to original design manufacturers (ODMs), knowing that the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities will ultimately be included in OEM products and sold to customers in the United States.

286. Indeed, Intel's "Intel Inside" campaign has informed customers through advertising and stickers on the OEM products themselves that the products contain the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities. Intel also knows that many such OEM products that contain the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities are made outside the United States and are imported into the United States in violation of U.S. patent law. Intel also knows that U.S. customers of the OEMs use the OEM products containing the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities in the United States in violation of U.S. patent law.

287. Intel also publicly provides documentation, including datasheets available through Intel's publicly accessible ARK service and software developer's manuals, instructing customers

on uses of Intel's products that infringe the '631 Patent. *See, e.g.*, <http://ark.intel.com>. In addition, Intel specifically advertises and promotes the infringing use of Intel's products, including the ring bus system and its equivalent. *See, e.g.*, <https://software.intel.com/en-us/articles/how-memory-is-accessed>.

288. On information and belief, Intel's customers directly infringe the '631 Patent by, for example, making, using, offering to sell, and selling within the United States, and importing into the United States, without authority or license, products containing the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities.

289. Intel contributes to the infringement of the '631 Patent in violation of 35 U.S.C. § 271(c). As stated above, on information and belief Intel was aware of the '631 Patent before this lawsuit was filed but Intel was aware of the '631 Patent at least as of the time of service of the Complaint in PACT XPP Schweiz AG v. Intel Corporation, 1-19-cv-00267 (DED). Intel thus offers to sell and sells within the United States the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities knowing that those products constitute a material part of the claimed invention because Intel incorporates the accused components (ring bus system, multi-cores, LLCs, etc.) into the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities.

290. Intel knows that the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities are especially made or especially adapted for use in infringing the '631 Patent because the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities all contain the infringing components (ring bus system, multi-cores, LLCs, etc.). Furthermore, because the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron

Instrumentalities contain the infringing components (ring bus system, multi-cores, LLCs, etc.), they are not a staple article or commodity of commerce suitable for substantial non-infringing use.

291. In addition, Intel offers to sell and sells the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities to Original Equipment Manufacturers (OEMs) and/or Original Design Manufacturers (ODMs) who then incorporate the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities into infringing products which are used, sold, offered for sale, and/or imported in the United States in an infringing manner. Accordingly, Intel is liable as a contributory infringer.

292. In the alternative, to the extent Intel does not meet all of the limitations of the '631 Patent by making the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities in the United States, Intel infringes under 35 U.S.C. § 271(f)(1) and (f)(2) by supplying from the United States a substantial portion of the components of the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, and the Accused Celeron Instrumentalities (for example, structures or components contained in semiconductor wafers or dies or the like), and actively induces the combination of components outside the United States in a manner that would infringe the '631 Patent (for example, by packaging or assembly, or by incorporation into desktop computers, laptops, servers, tablets, or the like by ODMs or OEMs). Intel further supplies from the United States components which are especially made and especially adapted for use in practicing the '631 Patent, and not staple articles or a commodity of commerce suitable for substantial non-infringing use (for example, structures or components contained in semiconductor wafers or dies or the like). Intel knows the components are especially made and especially adapted to be combined outside of the United States in a manner that would infringe the '631 Patent (for example, by packaging or assembly, or by incorporation into desktop

computers, laptops, servers, tablets, or the like by ODMs or OEMs). Based on these facts and the facts set forth in the paragraphs above, Intel infringes the '631 Patent under 35 U.S.C. § 271(f)(1) and (f)(2).

293. As a result of Intel's infringement of the '631 Patent, PACT has been damaged. PACT is entitled to recover for damages sustained as a result of Intel's wrongful acts in an amount subject to proof at trial but no less than a reasonable royalty.

294. In addition, Intel's infringing acts and practices have caused and are causing immediate and irreparable harm to PACT.

295. PACT is informed and believes, and thereon alleges, that the infringement of the '631 Patent by Intel has been and continues to be willful. As noted above, at least as of the service of the Complaint in PACT XPP Schweiz AG v. Intel Corporation, 1-19-cv-00267 (DED), Intel has actual knowledge of its infringement of the '631 Patent. Intel has deliberately continued to infringe in a wanton, malicious, and egregious manner, with reckless disregard for PACT's patent rights. Thus, Intel's infringing actions have been and continue to be consciously wrongful, entitling PACT to increased damages under 35 U.S.C. § 284.

296. PACT is informed and believes, and thereon alleges, that this is an exceptional case, which warrants an award of attorney's fees to PACT pursuant to 35 U.S.C. § 285.

#### **COUNT XII – INFRINGEMENT OF U.S. PATENT NO. 9,552,047**

297. PACT incorporates each of the above paragraphs 1-35 as though fully set forth herein.

298. PACT is informed and believes, and thereon alleges, that Intel has infringed and unless enjoined will continue to infringe one or more claims of the '047 Patent, in violation of 35 U.S.C. § 271, by, among other things, making, using (including testing), offering to sell, and selling within the United States, supplying or causing to be supplied in or from the United States,

and importing into the United States, without authority or license, Intel products with the infringing features, including the Accused Turbo Boost Instrumentalities.

299. For example, the Accused Turbo Boost Instrumentalities embody every limitation of at least claim 1 of the '047 Patent, literally or under the doctrine of equivalents, as set forth below. The further descriptions below, which are based on publicly available information, are preliminary examples and are non-limiting.

***"A multiprocessor system comprising"***

300. The Accused Turbo Boost Instrumentalities are a multiprocessor system because they are multi-core processors.

***"a plurality of data processing units, each of the data processing units (a) being programmable; and (b) being adaptable for sequentially processing data in a clocked manner; and including"***

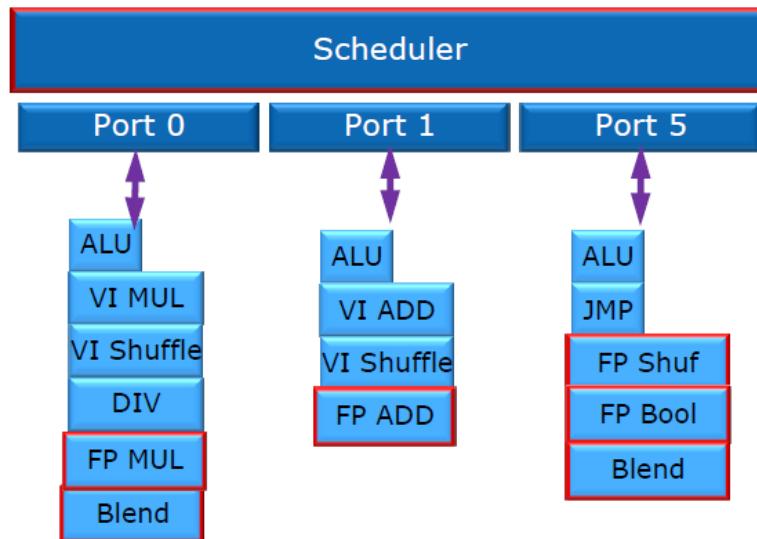
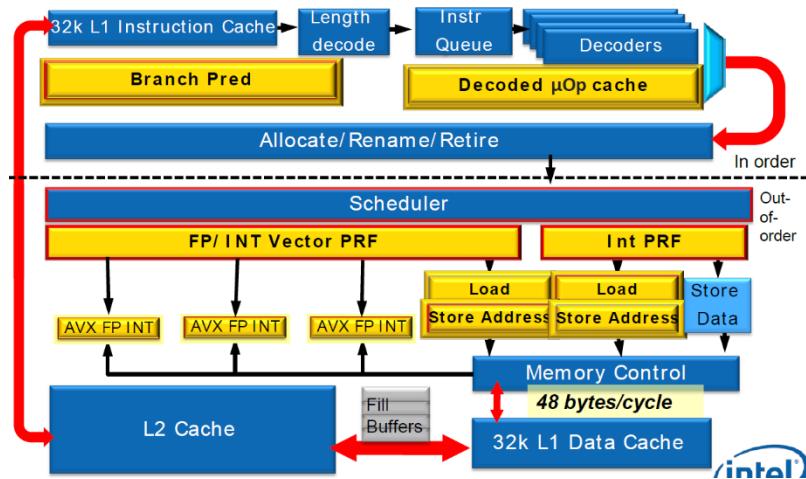
301. The Accused Turbo Boost Instrumentalities comprises of a plurality of processing cores as well as a graphics processor, where each core/graphics processor is programmable by, for example, at least Intel's integrated voltage regulator.

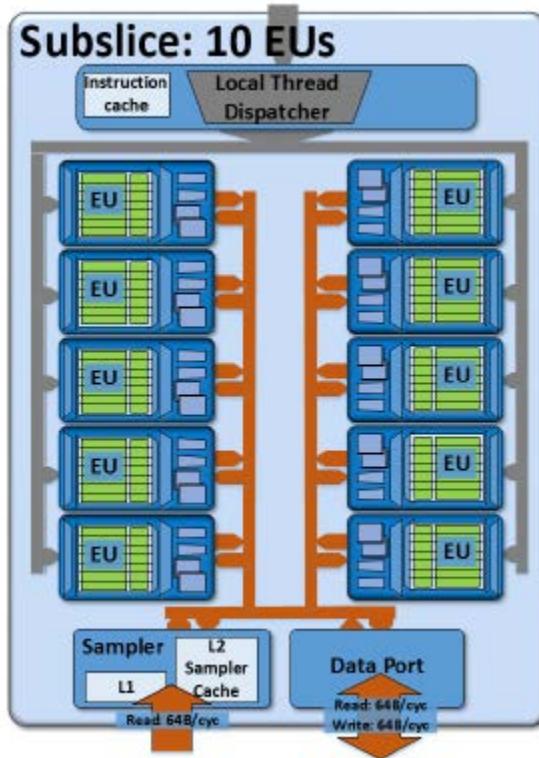
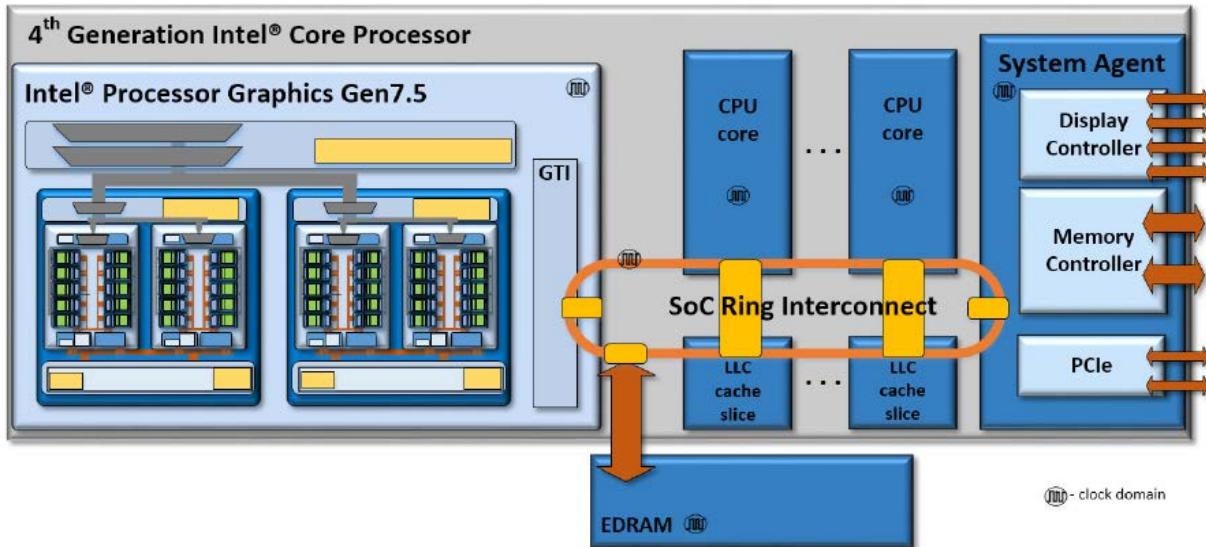
302. The core/graphics processors are adaptable for sequentially processing data in a clocked manner at least with regard to preparing and rendering graphics frames.

***"(c1) at least one Arithmetic Logic Unit (ALU), and (c2) at least one data register set for storing intermediate results in sequential data processing;"***

303. Each of the core/graphics processors in the Accused Turbo Boost Instrumentalities includes at least one ALU, and at least one register and/or cache for storing intermediate results in sequential data processing as shown below:

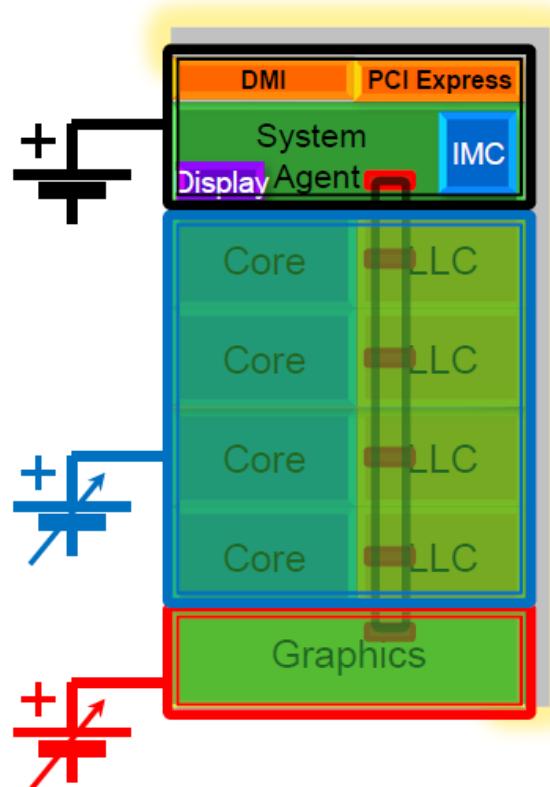
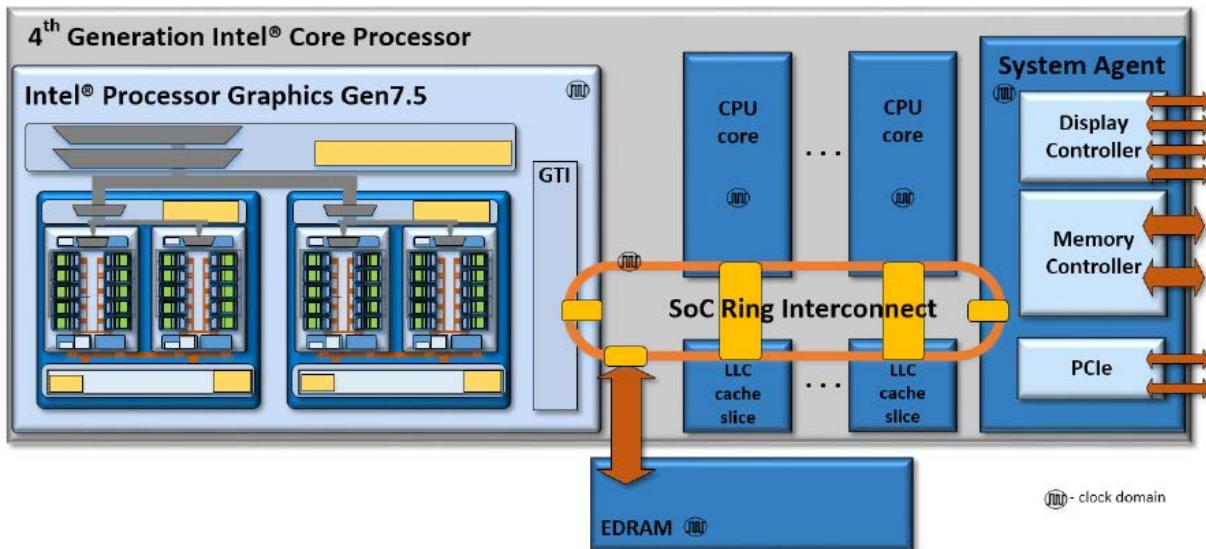
### Putting it Together – Core Microarchitecture





*“at least one bus system for at least interconnecting at least some of the data processing units, each being provided a supply voltage by a voltage supply;”*

304. The Accused Turbo Boost Instrumentalities include a ring bus system (or equivalents) interconnecting at least some of the core/graphics processors, which is provided a supply voltage by a voltage supply as shown below:



*“wherein for at least some of the data processing units, the clock frequency is adjustable at runtime without affecting the clock frequency of at least one of: one other of the data processing units, and the bus system; and”*

305. The Accused Turbo Boost Instrumentalities comprise core/graphics processors for which the clock speed is adjustable at runtime without affecting other core/graphics processors and/or the bus system, because the accused core/graphics processors' clock speeds can be determined independent at runtime without affecting the clock speeds of others at least through Intel's integrated voltage regulator and/or the Turbo Boost feature.

*“wherein the voltage supply is adapted to supply higher supply voltages for data processing at higher clock frequencies.”*

306. The Accused Turbo Boost Instrumentalities comprise core/graphics processors adapted to operate in Turbo Boost mode in which the core/graphics processors are provided higher supply voltages to enable operation at higher clock frequencies.

307. In violation of 35 U.S.C. § 271, Intel has infringed and is currently infringing, directly and/or through intermediaries, the '047 Patent by making, using, selling, offering for sale, and/or importing into the United States, without authority, products that practice at least claim 1 of the '047 Patent. These products include the Accused Turbo Boost Instrumentalities, and any other products that incorporate the Accused Turbo Boost Instrumentalities. Intel has infringed and is currently infringing literally and/or under the doctrine of equivalents.

308. To the extent the method claims of the '047 Patent are also performed by Intel's customers, end users and/or other intermediaries, Intel infringes because the customers, the end users, and/or the intermediaries using the products Intel manufactures can only use said products if using programming steps provided by Intel and under the terms prescribed by Intel, because

Intel through its programming and manufactures controls the method whereby users are able to use the infringing processors, and because Intel conditions receipt of the benefit of the accused feature upon performance of the steps of the patented method(s) and establishes the manner and/or timing of that performance, and Intel is thus liable under Section 271(a).

309. On information and belief, PACT asserts that Intel was aware of this patent before this lawsuit was filed, and at least as of the service of the Complaint in PACT XPP Schweiz AG v. Intel Corporation, 1-19-cv-00267 (DED), Intel had actual knowledge of its infringement of the '047 Patent.

310. PACT is informed and believes, and thereon alleges, that Intel, subsequent to the time it first learned of the '047 Patent and at least as of the time of service of the Complaint in PACT XPP Schweiz AG v. Intel Corporation, 1-19-cv-00267 (DED), specifically intended to induce patent infringement by third-party original equipment manufacturers (OEMs), customers, and users of the Accused Turbo Boost Instrumentalities and had knowledge that the inducing acts would cause infringement or is willfully blind to the possibility that their inducing acts would cause infringement. Intel has sold and continues to sell the Accused Turbo Boost Instrumentalities to OEMs making OEM products (*e.g.*, computers, laptops, tablets, etc.), knowing that the Accused Turbo Boost Instrumentalities will be included in the OEM products and sold to customers in the United States in violation of U.S. patent law, and/or to original design manufacturers (ODMs), knowing that the Accused Turbo Boost Instrumentalities will ultimately be included in OEM products and sold to customers in the United States.

311. Indeed, Intel's "Intel Inside" campaign has informed customers through advertising and stickers on the OEM products themselves that the products contain the Accused Turbo Boost Instrumentalities. Intel also knows that many such OEM products that contain the Accused Turbo

Boost Instrumentalities are made outside the United States and are imported into the United States in violation of U.S. patent law. Intel also knows that U.S. customers of the OEM products containing the Accused Turbo Boost Instrumentalities in the United States in violation of U.S. patent law.

312. Intel also publicly provides documentation, including datasheets available through Intel's publicly accessible ARK service and software developer's manuals, instructing customers on uses of Intel's products that infringe the '047 Patent. *See, e.g.,* <http://ark.intel.com>. In addition, Intel specifically advertises and promotes the infringing use of Intel's products, including Turbo Boost. *See, e.g.,* <https://www.intel.com/content/www/us/en/architecture-and-technology/turbo-boost/turbo-boost-technology.html> and <https://www.intel.com/content/www/us/en/architecture-and-technology/turbo-boost/turbo-boost-max-technology.html>.

313. On information and belief, Intel's customers directly infringe the '047 Patent by, for example, making, using, offering to sell, and selling within the United States, and importing into the United States, without authority or license, products containing the Accused Turbo Boost Instrumentalities.

314. Intel contributes to the infringement of the '047 Patent in violation of 35 U.S.C. § 271(c). As stated above, on information and belief Intel was aware of the '047 Patent before this lawsuit was filed but Intel was aware of the '047 Patent at least as of the time of service of the Complaint in PACT XPP Schweiz AG v. Intel Corporation, 1-19-cv-00267 (DED). Intel thus offers to sell and sells within the United States the Accused Turbo Boost Instrumentalities knowing that those products constitute a material part of the claimed invention because Intel incorporates the accused components (core/graphics processors with Turbo Boost feature, etc.) into the Accused Turbo Boost Instrumentalities.

315. Intel knows that the Accused Turbo Boost Instrumentalities are especially made or especially adapted for use in infringing the '047 Patent because the Accused Turbo Boost Instrumentalities all contain the infringing components (core/graphics processors with Turbo Boost feature, etc.). Furthermore, because the Accused Turbo Boost Instrumentalities contain the infringing components (core/graphics processors with Turbo Boost feature, etc.), they are not a staple article or commodity of commerce suitable for substantial non-infringing use.

316. In addition, Intel offers to sell and sells the Accused Turbo Boost Instrumentalities to Original Equipment Manufacturers (OEMs) and/or Original Design Manufacturers (ODMs) who then incorporate the Accused Turbo Boost Instrumentalities into infringing products which are used, sold, offered for sale, and/or imported in the United States in an infringing manner. Accordingly, Intel is liable as a contributory infringer.

317. In the alternative, to the extent Intel does not meet all of the limitations of the '047 Patent by making the Accused Turbo Boost Instrumentalities in the United States, Intel infringes under 35 U.S.C. § 271(f)(1) and (f)(2) by supplying from the United States a substantial portion of the components of the Accused Turbo Boost Instrumentalities (for example, structures or components contained in semiconductor wafers or dies or the like), and actively induces the combination of components outside the United States in a manner that would infringe the '047 Patent (for example, by packaging or assembly, or by incorporation into computers, servers, or the like by ODMs or OEMs). Intel further supplies from the United States components which are especially made and especially adapted for use in practicing the '047 Patent, and not staple articles or a commodity of commerce suitable for substantial non-infringing use (for example, structures or components contained in semiconductor wafers or dies or the like). Intel knows the components are especially made and especially adapted to be combined outside of the United States in a manner

that would infringe the '047 Patent (for example, by packaging or assembly, or by incorporation into computers, servers, or the like by ODMs or OEMs). Based on these facts and the facts set forth in the paragraphs above, Intel infringes the '047 Patent under 35 U.S.C. § 271(f)(1) and (f)(2).

318. As a result of Intel's infringement of the '047 Patent, PACT has been damaged. PACT is entitled to recover for damages sustained as a result of Intel's wrongful acts in an amount subject to proof at trial but no less than a reasonable royalty.

319. In addition, Intel's infringing acts and practices have caused and are causing immediate and irreparable harm to PACT.

320. PACT is informed and believes, and thereon alleges, that the infringement of the '047 Patent by Intel has been and continues to be willful. As noted above, at least as of the service of the Complaint in PACT XPP Schweiz AG v. Intel Corporation, 1-19-cv-00267 (DED), Intel has actual knowledge of its infringement of the '047 Patent. Intel has deliberately continued to infringe in a wanton, malicious, and egregious manner, with reckless disregard for PACT's patent rights. Thus, Intel's infringing actions have been and continue to be consciously wrongful, entitling PACT to increased damages under 35 U.S.C. § 284.

321. PACT is informed and believes, and thereon alleges, that this is an exceptional case, which warrants an award of attorney's fees to PACT pursuant to 35 U.S.C. § 285.

#### **PRAYER FOR RELIEF**

WHEREFORE, PACT prays for judgment as follows:

- a) That Intel has infringed, and unless enjoined will continue to infringe, each of the Asserted Patents;
- b) That Intel has willfully infringed each of the Asserted Patents;
- c) That Intel, its officers, agents, servants, and employees, and those persons in active concert or participation with any of them, be preliminarily and permanently

enjoined from commercially manufacturing, using, offering for sale, selling in the United States, or importing into the United States, the Accused Core Instrumentalities, the Accused Xeon Instrumentalities, the Accused Celeron Processor, the Accused Turbo Boost Instrumentalities, the Accused Stacking Instrumentalities, the Accused '505 Instrumentalities, and any other product that infringes or induces or contributes to the infringement of the Asserted Patents, prior to the expiration date of the last to expire of those patents;

- d) That PACT be awarded monetary relief sufficient to compensate PACT for damages resulting from Intel's infringement of the Asserted Patents, including a reasonable royalty under 35 U.S.C. § 284, and that such monetary relief be awarded to PACT with prejudgment and post-judgment interest;
- e) That PACT be awarded enhanced damages, up to and including trebling of the damages awarded to PACT;
- f) That PACT be awarded the attorneys' fees, costs, and expenses that it incurs prosecuting this action under 35 U.S.C. § 285 and;
- g) That PACT be awarded such other and further relief as this Court deems just and proper.

**DEMAND FOR JURY TRIAL**

Pursuant to Federal Rule of Civil Procedure 38, PACT hereby demands a trial by jury on all issues triable to a jury.

Dated: April 23, 2019

Respectfully submitted,

By: /s/ Craig D. Cherry  
Craig D. Cherry  
State Bar No. 24012419  
ccherry@haleyolson.com  
**HALEY & OLSON, P.C.**  
100 N. Ritchie Road, Suite 200  
Waco, Texas 76712  
913 Franklin Ave., Suite 201  
Waco, Texas 76701  
Telephone: (254) 776-3336  
Facsimile: (254) 776-6823

J. Mark Mann  
State Bar No. 12926150  
mark@themannfirm.com  
G. Blake Thompson  
State Bar No. 24042033  
blake@themannfirm.com  
**MANN | TINDEL | THOMPSON**  
300 West Main St.  
Henderson, Texas 75652  
913 Franklin Ave., Suite 201  
Waco, Texas 76701  
Telephone: (903) 657-8540  
Facsimile: (903) 657-6003

*Attorneys for Plaintiff*  
*PACT XPP Schweiz AG*